ENVISIONING ENVIRONMENTS:
DESIGNS FOR URBAN U.S. FREEWAYS, 1956-1968

A Dissertation

Presented to the Faculty of the Graduate School

of Cornell University

In Partial Fulfillment of the Requirements for the Degree of

Doctor of Philosophy

by

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December 2017

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Cornell University 2017

This dissertation analyzes designers' efforts to visualize ecological aspects of freeway infrastructures amidst the 1960s freeway revolts. From the postwar years through the 1960s, U.S. freeway plans catalyzed a public reckoning regarding the natures of cities. Government officials, urban dwellers, and designers and planners across the United States debated the infrastructures' placement, wrangling over the values of threatened sites and neighborhoods. Through these debates, prior conceptions of urban environments expanded to encompass the dynamic, living, and inter-relational dimensions of cities. This transformation took place via public discourse, and also through innovative design approaches, as architects, landscape architects, and urban designers engaged freeway designs as opportunities for technical and methodological experimentation. Mixing earlier generations' parkway visions and concerns for spatial experience with emergent cybernetic themes, data-driven analysis, scientific references, and anticipations of computerization, these explorative designs modeled natural forces in new ways, and at new scales.

The following chapters examine freeway projects by Lawrence Halprin, Kevin Lynch, Donald Appleyard, Christopher Alexander, Ian McHarg, and others, drawing on frameworks from environmental history and science and technology studies to interrogate how freeway design processes engaged public controversies and modeled human/nature relationships. The

chapters advance in time and scale, showing how conceptualizations of the urban environment shifted with changes in drawing implements, uses of eyes and hands, inclusion and exclusion of data, and designers' understandings of their roles relative to living forces. The resulting fine-grained account charts how urban infrastructures, environmental ideas, and design practices evolved together from the mid 1950s through the late 1960s: tracking the evolution of urban environmentalism, elucidating sensorial aspects of freeways, and scrutinizing the political advantages and cultural complications of visualizing landscapes through data-based quantification.

This text makes designers' roles in environmental movements more accessible to a broad range of scholars. It contributes to an emerging transdisciplinary discourse regarding environmental histories of design, and forges new ground at the intersection of literatures on ecological design, architectural drawing and making, urban environmental history, and science and technology studies. Above all, it articulates what is at stake – socially, politically, and environmentally – in how designers engage the many skilled actions of designing.

BIOGRAPHICAL SKETCH

Margot Lystra holds a Master of Landscape Architecture from the Harvard Graduate School of Design and a Bachelor of Arts in Biology from Swarthmore College. She has taught landscape architectural design, representation, and theory at California Polytechnic State University – San Luis Obispo and University of Detroit Mercy, as well as at Cornell. Her work has been published in *Studies in the History of Gardens and Designed Landscapes*, *The Next American City*, and *Crit – Journal of the AIAS*. As a designer, she has worked for CMG Landscape Architecture, the Detroit Collaborative Design Center, and various San Francisco-based landscape architecture firms.

for my family

ACKNOWLEDGMENTS

This work was completed with the kind assistance of many minds and hands. I offer thanks to all the following individuals and organizations, while acknowledging, of course, that any errors within this document are mine alone. First and foremost, I am grateful for the constructive support of my committee: chair Mary N. Woods, and members Jeremy Foster, Sara Pritchard, and Sonja Dümpelmann. Each committee members' teaching, mentorship and feedback has been unique in character and subject. Collectively, their guidance has proved remarkably synchronous: at once complementary and continuous, in serendipitous and productive ways. In addition to my committee, other Cornell faculty have also shaped this work. Courses with Stacey Langwick and Branden Hookway informed the methodological and theoretical approaches deployed here; Lily Chi, Medina Lasansky, and Chris Otto all offered incisive commentary, guidance, and encouragement over the years.

Several organizations generously supported this dissertation's research and writing. Research travel was made possible through funding from the Clarence Stein Institute for Urban and Landscape Studies, the Cornell Institute for Social Sciences Research, and the Cornell Architecture Department's Robert D. MacDougall Scholarship and A. Henry Detweiler Traveling Fellowship. Late-stage writing was greatly assisted by a Short-Term Predoctoral Residency in Garden and Landscape Studies at Dumbarton Oaks.

I give thanks to the many archivists who helped me conduct dissertation research. I express special gratitude to Bill Whitaker and Nancy Thorne, of the Architectural Archives at the University of Pennsylvania: their deep knowledge of their collections and refreshing openness in sharing that knowledge led to fortuitous and influential discoveries in the early phases of

research. Thank-yous are also due to individuals at several California archives, including Dave Lushbaugh at the Caltrans Transportation Library and History Center, and archivists, librarians, and staff at the San Francisco History Center, Clerk's office of the San Francisco Board of Supervisors, San Francisco Public Library, Bancroft Library at the University of California Berkeley, and California State Archives. I also thank Myles Crowley at the MIT Institute Archives, Nancy Adgent at the Rockefeller Archive Center, Mary Daniels at the at the Frances Loeb Library of the Harvard Graduate School of Design, archivists in Special Collections at the University of Florida Smathers Library, and all the archivists at Cornell's Rare and Manuscript Collections, who have kindly assisted me many times over.

This work would not be what it is without the enthusiasm and generous feedback of many colleagues. Initial studies on Lawrence Halprin and Ian McHarg's cybernetic influences were aided by feedback from Susan Herrington, Sonja Dümpelmann, and Kathleen John-Alder. I offer gratitude to Roger Osbaldeston: talking with him about his years working at Lawrence Halprin and Associates was informative and delightful. Early work was also improved through discussion with my cohort in the History of Architecture and Urban Development program; I give special appreciation here to Elvan Cobb, who has been a steady colleague and friend ever since we arrived at Cornell together in 2010. Chapter Four benefitted greatly from workshop review with Kjetil Fallan, Finn-Arne Jørgensen, and participants in the Environmental Histories of Design workshop at the Rachel Carson Center in Munich, Germany; and from anonymous reviewers who shepherded the transformation of workshop material into article form. Convivial discussion with my dissertation writing group colleagues Sophie Hochhäusl, Josi Ward, and Caroline Jack improved material in several dissertation chapters. I am also grateful for productive discussions with scholars in attendance at Dumbarton Oaks in spring 2017, especially

Jeanne Haffner and Peter Ekman; for email correspondence with Paul Emmons; and for the writing-session companionship of Anaar Desai-Stevens and Erin Putalik.

The questions guiding this dissertation began forming many years ago, under tutelage of instructors and mentors in landscape architectural design. Well in advance of doctoral study, Holly Getch Clarke, Michael Blier, Dorotheé Imbert, and Dan Pitera all taught me how to practice design with openness, empathy, and deep curiosity for the past and present agencies of living sites. Enlivening discussions and design collaborations with former colleagues Sarah Cowles and Jana Cephas were invaluable in shaping my conviction that *how* we design matters greatly to the communities and ecologies in which we live.

I am grateful to my family, friends, and local community: all have been patiently supportive throughout this project. In the final months of writing, Brian Myers and Suet Cheng kindly offered space for focused work, and the baristas and regulars at my neighborhood Gimme Coffee kept my spirits buoyed. Lastly, I express immense gratitude – too great to contain in the following sentence – to my family. My partner Joe Marraffino and parents Don and Doni Lystra have provided crucial support, stability, childcare, proofreading, and optimism as I traveled to archives with a toddler in tow, escaped for stints of solitary writing, and navigated all the logistical and creative challenges inherent to conducting scholarly work.

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INTRODUCTION

> Rapid expansion of knowledge and technical development have swept us into a world beyond our grasp; and the face of nature is alien once again. … If we are to understand the new landscape, we need to touch it with our senses and build the images that will make it ours.
>
> - György Kepes, 1956[1]

> How do you measure the value of the giant sycamores that were hacked down to cut a freeway through Bidwell Park? ... How do you measure the value of the quiet green acres where residents of Chico found beauty and recreation – acres now covered by a 20-foot-high barrier topped by a procession of cars and trucks roaring along at 60 m.p.h.?
>
> - Harold Gilliam, 1964[2]

From the postwar years through the 1960s, U.S. freeway plans catalyzed a public reckoning regarding the natures of cities. Government officials, urbanites, and designers in urban areas across the United States debated the infrastructures' placement: wrangling over the values of threatened sites and neighborhoods. As the "freeway revolts" multiplied and grew, so did the issues they explored. Rampant suburbanization, growing popular environmentalism, civil rights, expanding governmental funding and oversight, emerging new digital technologies, disciplinary evolution: freeway debates and designs touched upon all of these movements. At the same time, many of the questions emerging through the freeway revolts were also quite essential. What, exactly, comprises a city? How is it lived? And how does its design impact inhabitants' lives? To explore such questions, those involved in freeway debates increasingly embraced a concept that was open enough to encompass all the issues at hand: the "urban environment."

[1] György Kepes, *The New Landscape in Art and Science* (Chicago: Paul Theobald, 1956), 19-20.
[2] Harold Gilliam, "The Freeway Octopus," *San Francisco Chronicle*, October 12, 1964.

The idea that cities and their regions were complex living milieus was not entirely new in the 1960s. A handful of U.S. conservationists, designers, planners, and sociologists had been using the terms "environment" and "ecology" in association with urban phenomena since at least the 1930s.[3] In that decade the term "freeway" – denoting a highly utilitarian high-speed roadway separated from other urban systems – had also emerged. Throughout the freeway debates, these recently defined entities – "freeway" and "urban environment" – became entangled in new ways. As they were mobilized in public discourse, design practices, and governmental contexts, novel connotations circulated through image and language, among many different stakeholders: both entities accrued new definitions, ways of seeing, drawing techniques, uses of computation, and forms of legislation. The result was a reconceptualization – indeed, activation – of cities and urban regions on newly dynamic, holistic, systematic, and hybrid terms.

This dissertation centers on the roles of U.S. urban designers in that transformation: examining a handful of theoretical and real-world design projects that reconceived freeway infrastructures as environmental entities.[4] I analyze novel explorations in design rhetoric, technique and method through which designers articulated the environmental effects of freeway and highway infrastructures: revealing how these experiments mixed earlier generations' parkway visions and concerns for spatial experience with emergent cybernetic themes, data-driven analysis, scientific references, and anticipations of computerization in order to model natural forces in new ways and at new scales. I also investigate the political, disciplinary, and cultural dimensions of the freeway debates, demonstrating how a brief flurry of experimental

[3] See Chapter One.
[4] In this dissertation, I usually use the term "designers" to refer to landscape architects, urban designers, planners, and architects involved in visualizing the environments of freeways. Among terms typically used for referencing all these professions, this one is the simplest, it is resonant with the fact that most of the designers discussed here saw themselves as "urban designers" at some point, and it foregrounds visual expertise (whereas the equally common "designers and planners" does not).

freeway design was imbricated within a series of broader shifts taking place throughout the United States in the 1960s. Together, the projects examined here offer a uniquely visual lens on those shifts, and elucidate just what was at stake in how designers chose to engage them.[5]

Debates over freeway planning and design prompted a wide variety of questions. How can one envision a freeway in a way that engages its massive scale, structural complexity, dynamism, and environmental impacts, so that these factors can be not only be recognized, but also designed with and communicated to others? And in the face of infrastructures this impactful on existing conditions, what should the roles and responsibilities of urban designers be? Should they seek to mitigate negative impacts with ameliorative design moves, in resonance with the roadside beautification movement that had previously defined highway landscaping? Should they envision radically new ways of living, as an extension of modernist design principles? Or should they embrace wilderness protection and extend regionalist greenbelt visions, in order to limit freeway development and protect existing environments?

This work unearths different ways that designers reckoned with these questions: explicitly through discourse, and tacitly through shifts in drawing and making practices. As they did, various tensions emerged between establishing environmental issues and design expertise in governmental contexts, maintaining understandings of cities and landscapes as irreducible wholes, and supporting the agencies of urban dwellers in defining their own lived experiences. Attendant to such tensions were puzzles regarding how to comprehend cities at multiple scales, from the immediate kinesphere of the inhabitant's body to the nation's highway network as a whole. As designers explored these issues, they tested various techniques and methods for

[5] This work does not attempt a comprehensive history of the term environment, or even of the term "urban environment"; it is, rather, a study of a particularly formative time in the latter's development, particularly with regards to how it was envisioned by designers.

interrelating lived, experiential understandings of urban space, systematically abstract analyses of cities, and technological innovation in regional land analysis and mapping. Freeways were catalysts at once experiential, political, conceptual, and structural: as such, they prompted designers to imagine and envision urban environments in radically new – and multiply conflicted – ways.

Three Literatures: How to Talk about Designing and its Impacts

As a subject of historical narrative, the 1960s U.S. freeway revolts present an enticingly messy tangle of themes, scales, issues, and perspectives: they can be approached from many sides, and inform debates in many disciplines. This dissertation primarily contributes to three literatures. Two of these – histories and theories of the built environment and science and technology studies discourses regarding naturecultures and skilled practices – don't often intersect, although that is beginning to change. The third is a nascent but growing collection of works that are transdisciplinary in their own right: building largely on environmental history frameworks, they also incorporate design histories and histories of technology and urbanism in order to investigate how landscapes, technologies, ways of seeing, and design and planning professions evolved together in the twentieth century. In identifying and expanding this literature, I contribute to an important new trajectory for landscape history and theory, and the history of the landscape architectural profession.

One of the challenges of a transdisciplinary approach is putting different literatures in dialogue with one another. In what follows, I will discuss the dissertation's relevance to each of these three discourses, with an emphasis on how they intersect and overlap relative to the subject at hand. With regards to each literature I will identify relevant discussions in general, hone in on

specific texts whose frameworks and methods are particularly useful to this project, and then explain how my approach contributes to the literature overall.

Regarding histories and theories of the built environment, this dissertation engages three major discussions within the field.[6] The first is, quite simply, histories of U.S. highway and freeway design and planning. Historians Timothy Davis, Christopher Wells, Joseph DiMento, Cliff Ellis, Mark Rose, and Raymond Mohl have all detailed various ways in which automobile roadways intertwined with the work of urban planners, landscape architects, and architects from the late nineteenth century through much of the twentieth.[7] In addition, numerous studies have discussed the histories of freeway controversies in specific cities.[8] These texts have focused on various aspects of roadway design, construction, and controversy: considering them as matters of environmental, political, governmental, and professional history. Relative to such studies, this

[6] In using the term "histories and theories of the built environment," I deploy a term advocated by Dianne Harris and used by many to identify theories and histories of architecture, landscape, planning, and urban design. This discussion is largely centered in architecture, landscape architecture, planning, and sometimes art history programs. Some of these works integrate history and theory, while others do not; in this discipline, theoretical works often involve polemics regarding the intent and purpose of design work. One could argue that histories of urbanism, urban environmental history, and histories of infrastructure should be included here as well; however, I do not include them, as they tend to be located more firmly within historical literature. I will discuss these histories when I address relevant transdisciplinary historical discourse.

[7] Timothy Davis has charted the history of parkway design in the United States. Wells' environmental history of roads recounts how automobility has fundamentally altered peoples' relationships to the natural world. Rose and Mohl recount government initiatives, planners' efforts, and political negotiations surrounding highways, from the late 1930s through the 1980s. DiMento and Ellis cover the same time period, with a focus on urban freeway debates. Timothy Davis, "The American Motor Parkway," *Studies in the History of Gardens & Designed Landscapes* 25.4 (2005), 219-249; Christopher W. Wells, *Car Country: An Environmental History* (Seattle: University of Washington Press, 2012); Mark H. Rose and Raymond A. Mohl, *Interstate: Highway Politics and Policy since 1939* (Knoxville: University of Tennessee Press, 2012); Joseph F. DiMento and Cliff Ellis, *Changing Lanes: Visions and Histories of Urban Freeways* (Cambridge, Mass.: MIT Press, 2013).

[8] I will reference several such works as relevant in specific chapters. See also, Eric Avila, *Folklore of the Freeway: Race and Revolt in the Modernist City* (University of Minnesota Press, 2014); Christopher Wells, "From Freeway to Parkway: Federal Law, Grassroots Environmental Protest, and the Evolving Design of Interstate-35E in Saint Paul, Minnesota," *Journal of Planning History* 11.1 (2012), 8-26; Sidney Wong, "Architects and Planners in the Middle of a Road War: The Urban Design Concept Team in Baltimore, 1966–71," *Journal of Planning History* 12.2 (2013), 179–202.

dissertation contributes an investigation of freeway design as a matter of design rhetoric, technique and method.

The second discussion involves a fast-growing body of scholarship regarding U.S. landscape and urban design from the postwar years through the 1970s. The majority of these studies have centered on the design agendas and built works of individual designers during this period. Alison Hirsch and Kathleen John-Alder, for example, have both recently written on design projects by Lawrence Halprin, focusing on their environmental and community-oriented dimensions.[9] John-Alder has also written on the theories and projects of Ian McHarg, as have Anne Whiston Spirn and Susan Herrington.[10] Sean Keller, Alise Upitis, and Molly Wright Steenson have examined the projects of Christopher Alexander in depth, and Anthony Raynsford and Hashim Sarkis have investigated the work of Kevin Lynch.[11] These figures are all central actors in the projects discussed here, and the broader representational, philosophical, and cultural

[9] Alison B. Hirsch, "Scoring the Participatory City: Lawrence (& Anna) Halprin's Take Part Process," *Journal of Architectural Education* 64.2 (2011), 127-140; Kathleen John-Alder, "Processing Natural Time: Lawrence Halprin and the Sea Ranch Ecoscore," *Studies in the History of Gardens & Designed Landscapes* 34.1 (2014), 52-70; Kathleen John-Alder, "A Field Guide to Form: Lawrence Halprin's Ecological Engagement with The Sea Ranch," *Landscape Journal* 31.1-2 (2012), 53-75.

[10] Several works discuss McHarg's legacy; few, however, have thus far placed his work in a historical context, and to date there is no book-length historical treatment of his oeuvre. The articles by John-Alder, Whiston Spirn, and Herrington are historical in character. Kathleen John-Alder, "Toward a New Landscape: Modern Courtyard Housing and Ian McHarg's Urbanism," *Journal of Planning History* 13.3 (2014), 187-206; Anne Whiston Spirn, "Ian McHarg, Landscape Architecture, and Environmentalism: Ideas and Methods in Context," in *Environmentalism in Landscape Architecture*, ed. Michel Conan (Washington D.C.: Dumbarton Oaks Research Library and Collection, 2000), 97-114; Susan Herrington, "The Nature of Ian McHarg's Science," *Landscape Journal* 29.1 (2010), 1-20.

[11] Sean B. Keller, "Fenland Tech: Architectural Science in Postwar Cambridge," *Grey Room* 23 (2006), 59-60; Alise Upitis, "Alexander's Choice: How Architecture Avoided Computer-Aided Design c. 1962," in *A Second Modernism: MIT, Architecture, and the 'Techno-Social' Moment*, ed. Arindam Dutta (Cambridge, Massachusetts: SA+Press, Department of Architecture, MIT, 2013), 474–505; Molly Wright Steenson, "Architectures of Information: Christopher Alexander, Cedric Price, and Nicholas Negroponte and MIT's Architecture Machine Group" (PhD diss., Princeton University, 2014), 37; Anthony Raynsford, "Spectacle of the Hyper-Real: Environmental Simulation, Cybernetic Subjects, and Urban Design," eds. Mark Goulthorpe and Amy Murphy, *100th ACSA Annual Meeting Proceedings, Digital Aptitudes* (2012), 654–660; Hashim Sarkis, "Disoriented: Kevin Lynch, Around 1960," in *A Second Modernism*, ed. Dutta, 394-435.

themes in these studies are highly relevant to the discussions that follow. In contrast to these texts however, I largely set aside discussion of individual designers' agendas and oeuvres in order to focus instead on the ways that individual freeway projects interrelated with local dynamics, manifested experimental approaches to design, influenced the design disciplines, and engaged shifts in governance.[12]

The third discussion that I draw on within histories and theories of the built environment is also the most influential to this dissertation: analyses of design representation that interrogate the specific dynamics of drawing and making.[13] Such studies have often integrated historical and theoretical discourse. In architectural history, the writings of Robin Evans have been definitive in this area; works by Paul Emmons, David Leatherbarrow, Stan Allen, and others have further developed the discussion.[14] In art history, 1990s analyses of representation by Hal Foster and

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[12] The recent work of Patrick Nugent has forged a similarly project-oriented approach, which is akin to other transdisciplinary approaches that I discuss here. Patrick Nugent, "From the Richmond Parkway to the Staten Island Greenbelt: The Rise of Ecological Zoning in New York City," *Journal of Planning History* 16.2 (2017), 139-161.

[13] In their very quietness, the techniques and methods of drawing and designing have been less investigated among design historians and theorists than one might expect. Designers themselves have referred to this quietness from time to time. For example, Halprin described working with and learning from Thomas Church: "He never told you anything very much, but working on projects with him you observed it." Lawrence Halprin, "A Landscape Architect's Appreciation of Church's Place in Environment Design History," in *Thomas Church, Landscape Architect*, interviews conducted by Suzanne B. Riess, Regional Oral History Office, The Bancroft Library, University of California, Berkeley, 1978, 739.

[14] Robin Evans wrote extensively on renaissance drawing practices. Distinguishing between drawings' design and documentary capacities, he asserted that design drawings were inseparable from the ways in which they were drawn. Focusing on the modern era, Paul Emmons discusses the varied conceptual and practical roles of diagrams. Like Corner, Emmons identifies specific dynamics within the process of making – tensions between imagination and measurement – through which architects engage invention. David Leatherbarrow has juxtaposed renaissance drawing practices against twentieth-century approaches, asserting that, when discovering new ways to define space, architects fundamentally alter how they perceive and construct space as well. Robin Evans, *The Projective Cast: Architecture and its Three Geometries,* (Cambridge, Mass: MIT Press, 1995), 108; Robin Evans, "Architectural Projection," in *Architecture and its Image: Four Centuries of Architectural Representation: Works from the Collection of the Canadian Centre for Architecture,* eds. Blau, E., Kaufman, E., Evans, R., & Centre Canadien d'Architecture, (Montreal: Canadian Centre for Architecture, 1989), 21; Paul Emmons, "Intimate Circulations - Representing Flow in House and City," *AA Files: Annals of the Architectural Association*

Martin Jay are relevant, while Glenn Adamson has led a more recent discussion of craft and tacit knowledge.[15] In landscape architectural history and theory, James Corner, Catherine Dee, Laurie Olin, and Charles Waldheim have all explored the histories and ramifications of specific drawing and making modes such as hand drawing, construction documents, and aerial photography.[16] In all of these studies, the process of designing is investigated as a productive landscape condition in its own right: one that engages broad technological and material dynamics; conditions designers' thoughts and actions; and impacts larger cultural understandings of space, landscape, and the act of intervening in the built world.[17]

Allen and Corner's theoretical writings on architectural and landscape architectural drawing and making are particularly relevant here: together they lay groundwork for interrogating the deep politics of design actions. In *Practice*, Allen likens design drawing and

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School of Architecture (2005), 51; Paul Emmons, "Embodying Networks: Bubble Diagrams and the Image of Modern Organicism," *The Journal of Architecture* 11.4 (2006), 441-461; David Leatherbarrow, "Architecture and its Horizons," *Uncommon Ground: Architecture, Technology, and Topography* (Massachusetts Institute of Technology: 2000), 12. See also Mark Wigley, "Paper, Scissors, Blur," in Catherine de Zegher and Mark *Wigley* eds., *The Activist Drawing* (New York: Drawing Center; Cambridge Mass., MIT Press, 2001), 27-57.

[15] Martin Jay, "Scopic Regimes of Modernity," in *Vision and Visuality*, ed. Hal Foster, Dia Art Foundation (Seattle: Bay Press, 1988), 3-23; Glenn Adamson, *The Craft Reader* (Berg Publishers, 2010).

[16] Catherine Dee has considered how certain drawing actions such as erasure or marking can amplify the designer's capacity to think critically while designing. Discussing construction documents, Laurie Olin has described how AutoCAD use has brought about increased iteration in the design process. Charles Waldheim has investigated the historical role of aerial imagery in shifting landscape architects' ways of seeing. James Corner, "Representation and Landscape: Drawing and Making in the Landscape Medium," *Word & Image 8* (July-Sept. 1992)," 243-275; James Corner, "Eidetic Operations and New Landscapes," in *Recovering Landscape: Essays in Contemporary Landscape Architecture,* ed. James Corner (New York: Princeton Architectural Press, 1999), 153-169; Catherine Dee, "Plus and Minus: Critical Drawing for Landscape Design," in *Drawing/Thinking: Confronting an Electronic Age*, ed. Marc Treib (London: Routledge, 2008), 60-71; Laurie Olin, "Drawings at Work: Working Drawings, Construction Documents," in *Representing Landscape Architecture*, ed. Marc Treib (London: Taylor & Francis, 2008), 140-159; Laurie Olin, "More than Wriggling Your Wrist (Or Your Mouse): Thinking, Seeing, and Drawing," in *Drawing/Thinking*, ed. Treib, 82-99; Charles Waldheim, "Aerial Representation and the Recovery of Landscape," in *Recovering Landscape: Essays in Contemporary Landscape Architecture*, ed. James Corner (New York: Princeton Architectural Press, 1999), 121-139.

[17] I call out these particular works because they focus on technique and method, rather than framing representations either as objects seen by the viewer, or tools of designers' strategic strategies of persuasion.

making to Michel De Certeau's notion of walking in the city, suggesting that design actions have discursive qualities and disruptive capacity.[18] Allen argues that designing has world-changing power: it is a "*performative practice*, capable of continually reworking the limits of a discipline from within."[19] Corner also invests design drawing and making with transformative power; fitting with his landscape architectural focus, he foregrounds such practices' capacities for natural, rather than social, engagement. According to Corner, tensions between measurement and imagination inherent to the work of designing generate a "field of revelation": an open-ended, generative zone of explorative action in which the designer engages the agencies of the landscape being designed.[20] In this formulation, the activity of drawing exceeds the designer's individual intent: as such, it is a constitutive practice in its own right. For Corner, "the question, then, concerns not so much the kinds of images designers should work with but rather what kinds of imaging *activities* should be developed and advanced."[21]

Following these two theorists, design practices can be discursively generative: forming not only new ways of seeing, but also new conceptions of the very character of their work and the world. Furthermore, because drawing and making actions can disrupt existing schema, they have political capacity. Lastly, these practices are most effective when the one enacts design as an ongoing encounter, expecting to emerge on the other side with new knowledge and conceptions

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[18] Allen writes: "the materials and procedures of architecture itself constitute a rich cultural matrix, capable of sustaining dense intellectual argument without recourse to concepts and language borrowed from other fields." Regarding De Certeau specifically, Allen references his notion of walking in the city as an everyday practice that actively resists and disrupts dominant narratives. Stan Allen, *Practice: Architecture, Technique, and Representation* (Australia: G+B Arts International, 2000), IX; Michel De Certeau, "Walking in the City," *The Practice of Everyday Life* (Berkeley: University of California Press, 1984), 91-110.

[19] Allen, *Practice*, XXIII.

[20] Corner writes: "Drawing holds the possibility of forming a field of revelation, prompting one to figure previously unforeseen landscapes of a richer and more meaningful dimension." Corner, "Representation and Landscape," 275.

[21] Corner, "Eidetic Operations and New Landscapes," 160.

of the natural. These arguments lay conceptual groundwork for this dissertation to explore several key questions. How do designers' representational and rhetorical discourses intersect, and what might we learn from the alignments or disjunctions that result? To what extent does a design practice's openness to uncertainty condition the agencies of the drawings' subjects, and of the designers themselves? Framed broadly, how have particular drawing and making practices interrelated with the social, environmental, and political contexts of which they are a part?

While Allen and Corners' 1990s writings remain influential, theoretical design discussions have since shifted away from such experiential, "phenomenological" investigations and towards more operative analyses regarding landscape urbanism, ecological urbanism, infrastructure, and the techno-social dimensions of architectural practice.[22] In this dissertation, I explore issues relevant to these more recent discussions, including uses of data in design, the challenges of working with large-scale projects, strategies for expanding the civic and ecological functions of infrastructures, and the values and problems of various digital techniques. I bring earlier discussions of drawing and making into conversation with these more recent themes in order to investigate what is politically and culturally at stake in the specific techniques and methods that designers use today in contemporary operative approaches at very large scales.

Science and Technology Studies Discussions of Naturecultures and Skilled Practices

In the years since Allen and Corner's writings on drawing and making, STS scholars have developed extensive discussions regarding the ways that scientists and other experts enact

[22] See, for example, Charles Waldheim ed., *The Landscape Urbanism Reader* (New York: Princeton Architectural Press, 2006); Kelly Shannon & Marcel Smets, *The Landscape of Contemporary Infrastructure* (Rotterdam: NAi Publishers, 2010); Michel Hoessler, "Open Source Systems," in *Territories: From Landscape to City*, ed. Lisa Diedrich (Basel: Birkhäuser, 2009), 129-131; Dutta, *A Second Modernism*.

interconnections between nature and culture via knowledge production and skilled practices.[23] These discussions merge fine-grained analyses of trained actions with explorations of relationships between humans and nonhumans, articulating specific ways in which everyday actions blur traditional boundaries between the natural, the human, and the technological.[24] In resonance with Allen, Corner, and others who have written on design drawing and making, these discussions support an understanding of such practices as culturally productive, interrelational encounters in their own rights, thereby offering particularly useful frames for investigating how designing engages complex living sites and conditions.[25] In its larger size and continued development, this literature has extended beyond art and design-based discussions of drawing and making, and therefore offers a more extensive set of frames and tools for analysis.

These discussions influence the dissertation in two key ways. One involves their cultivation of a fundamentally hybrid and socially constructive understanding of skilled practice. In light of these conversations, one can approach drawing as an activity capable of generating new forms of

[23] STS works receive occasional, but infrequent, reference in design literature – although this is changing. Kjetil Fallan, for example, has described potential uses of Actor–Network Theory in architectural research. Kjetil Fallan, "Traveling with Actor–Network Theory in the Land of Architectural Research," *Architectural Theory Review* 16. 2 (2011), 184–200.

[24] I focus on naturecultures here because this discourse is most essential to explain this dissertation's analytical approach. However, other STS works have been influential to this work as well, such as Elaine Daston and Peter Galison's work on objectivity. Lorraine Daston and Peter Galison, *Objectivity* (New York: Zone Books, 2007).

[25] Some STS scholars have tended to see the modernist movement as promoting an alienation of nature. Paul Edwards, for example, has honed Latour's "modernist settlement" argument to suggest that the construction of infrastructure inevitably positions nature as other. James Scott's discussion of Brasilia engages similar themes. However, Peder Anker's *From Bauhaus to Eco-house* and Olivier Botar and Isabel Wünsche's *Biocentrism and Modernism* have challenged such readings, revealing diverse modernist explorations regarding how to engage natural forces as matters of design. Paul Edwards, "Infrastructure and Modernity; Force, Time, and Social Organization in the History of Sociotechnical Systems," in *Modernity and Technology*, eds. T. Misa, P. Brey, and A. Feenberg (Cambridge, Mass: MIT Press, 2003), 185-225; Bruno Latour, *We Have Never Been Modern* (Cambridge, Mass: Harvard University Press, 1993); James Scott, *Seeing Like a State* (Yale University Press, 1998); Peder Anker, *From Bauhaus to Ecohouse: A History of Ecological Design* (Baton Rouge: Louisiana State University Press, 2010); Oliver A. I. Botar and Isabel Wünsche, eds., *Biocentrism and Modernism* (Ashgate Publishing, Ltd., 2011).

nature, culture, and their intrinsic interrelation. The other influence involves the clarity and nuance of these discussions' analytical and methodological approaches. By deploying a range of theoretical frameworks and ethnographic and archival methods, STS discussions regarding naturecultures provide precedents for directly tracking interconnections between small-scale practices and their broad material, cultural, and political impacts. On the basis of such precedents, the design historian can actively test theoretical propositions that emerged out of design-based studies of drawing and making in the 1990s.

Particularly relevant here are foundational discussions by Donna Haraway and Bruno Latour.[26] Both extend broadly Foucaultian investigations of ways that individual actions manifest broad power dynamics: illustrating how small everyday practices continually reconstitute political, material, and ideological connections between humans and nonhumans. Despite marked differences in their approaches, both scholars understand naturecultures as manifesting in the relational habits and patterns that humans and nonhumans practice over time.[27] By analyzing naturecultures in realms not typically associated with natures, such as laboratories, domestic environments and buildings, these works also provide models for identifying human/nature

[26] In *A Companion Species Manifesto*, Haraway advocates for cultivating human/nonhuman connections that both recognize otherness and practice intimacy. Though Haraway focuses on an individual relationship between human and dog, she suggests that such relations operate at larger scales as well: for example, she characterizes the land art of Andy Goldsworthy as a heterogeneous relationship with numerous nonhuman entities. Latour has written on the praxiographic dimensions of scientific representation: targeting the material, haptic, and relational aspects of the drawing process, and highlighting the role of the body in skilled practice. Donna Haraway, *The Companion Species Manifesto: Dogs, People, and Significant Otherness* (Chicago: Prickly Paradigm Press, 2003); Bruno Latour, "Drawing Things Together," in *Representation in Scientific Practice*, eds. Michael Lynch and Steven Woolgar (Cambridge, Mass: MIT Press, 1990), 19-68.

[27] Haraway often describes "naturecultures" on terms that are bodily, intimate, historically contingent, and politically anti-universal. Latour often describes "nature-culture" in more all-encompassing, politically structural terms: he considers the role of social compacts, for example, in (re)defining otherness, and the dynamics through which natural others gain representation in societies. Haraway, *Companion Species Manifesto*; Bruno Latour, *Politics of Nature: How to Bring the Sciences into Democracy* (Harvard University Press, 2004).

relationships within design practice, which largely occurs in offices, away from the sites to be designed. Furthermore, in their focus on the everyday co-imbrication of entities previously assigned opposite sides of a nature/culture divide, Haraway and Latour's analytical frameworks are uniquely honed for considering how designers engaged drawing practices in the 1960s: as tools for building a new awareness of the living, environmental dimensions of cities.[28]

A variation on natureculture discourse bears mentioning here. In recent years, Annemarie Mol, John Law, and others have initiated a turn in STS analyses towards studying skilled practices as forms of "enactment": in this approach, the multiplicity of objects is foregrounded as an ontological condition, rather than empirically elided.[29] Illuminating with regards to the formative role of bodily, tacit actions in treating patients and conducting medical research, these studies analyze how such actions generate meaning apart from actors' own conceptual perspectives on that meaning. Such works offer models for uncoupling designers' rhetoric and practices and considering them independently; in the chapters to come, this separation frequently yields insights regarding moments when designers' statements and design actions operated at distinct cross-purposes.

At the same time however, this recent "ontological turn" illustrates a core difficulty in adopting certain STS-based methods for design study. Recent analyses of enactment are insightful with regards to medical and scientific practices, where individual actions are often

[28] Latour is increasingly discussed among architectural theorists at present, and some previous STS-based studies have crossed over to architectural topics. Albena Yaneva, for example, has adapted Latour's approach to Actor-Network Theory for ethnographic architectural study, elaborating on his notion of "reassembling the social" in order to identify the agency of the becoming building as a part of the heterogeneous process of designing. Albena Yaneva, *The Making of a Building: A Pragmatist Approach to Architecture* (Oxford, England: Peter Lang, 2009).

[29] Annemarie Mol, *The Body Multiple: Ontology in Medical Practice* (Durham: Duke University Press, 2002); John Law, "Enacting Naturecultures: A Note from STS," *Centre for Science Studies, Lancaster University* (2004).

highly standardized and codified.[30] Designing, meanwhile, although it is a skilled practice, is by no means a science. Architects, landscape architects, and urban designers often position themselves, not as technicians, but as creative mediators: even when promoting "objective" analytical methods, they mix quantitative and qualitative practices, and strategically engage revelation as part of self-reflexive making processes.[31] This was abundantly the case among the designers discussed in this dissertation, who were well aware of both their cultural influence and their power to condition how humans and natures interrelated in the world.[32]

More methodologically open and therefore amenable to the mixed analytical/creative character of designing are writings by Haraway and Andrew Pickering.[33] In different ways, both of these scholars have engaged skilled practices in part from the practitioner's perspective: intentionally developing analytical frameworks from within the bounds of their own first-person experiences.[34] Approaching the practices they study as markedly open processes, both Haraway and Pickering acknowledge the agencies of all participants in a given set of relations, and

[30] These works do not only analyze scientific and medical practices; however, because the core model for this approach is based on such practices, its analytical methods are particularly fitting for the specific characteristics of those disciplines.

[31] The word "intuition" is chosen intentionally here, and will be discussed further in Chapter Five.

[32] This self-awareness influences my decision to primarily describe design practices as matters of "technique and method" within this dissertation: these terms acknowledge some degree of intentionality on the part of the designers.

[33] Haraway is particularly masterful at crafting first-person theoretical narratives, and the choice to write in this way is in part a feminist one. The feminist aspects of Haraway's work are too extensive to detail here; but they do underlie this dissertation's theoretical approach as well, particularly with regards to my decision to question masculinized readings of expertise by foregrounding the tacit practices, "soft" approaches, and conceptual contradictions underlying purportedly objective, technical projects. See Donna Haraway, "A Manifesto for Cyborgs: Science, Technology, and Socialist Feminism in the 1980s," *Socialist Review* 80 (1985).

[34] In *A Companion Species Manifesto*, for example, Haraway details her efforts to relate ethically with her dogs, her "intimate others," as part of a long imperfect history of coevolution between their two species. She describes the resulting dynamic as "otherness in relation," a conflicted yet loving, intimate yet historically conditioned practice of connecting across the natureculture boundary. In *The Mangle of Practice*, Pickering, a trained physicist, explicitly structures his analytical frameworks in acknowledgement of the practitioner's perspective. Haraway, *A Companion Species Manifesto*; Andrew Pickering, *The Mangle of Practice: Time, Agency, and Science* (Chicago: University of Chicago Press, 1995).

position the theorist within that set of relations: not as an analyst, but rather as a subject among subjects.[35] By incorporating their own subject-positions into their analyses, each scholar has developed relatively flexible, situated narratives regarding skilled practices: ones that, like Corner's descriptions of drawing, productively hold open questions of causality, intention, and assignment of agency.[36]

If we are to take seriously the revelatory capacity of design drawing and making, then maintaining a somewhat open analytical frame is essential. Such openness more accurately captures ways of working that are themselves calibrated in favor of uncertainty and transformation. It also makes it possible to acknowledge the separate yet interactive realities of designers' rhetoric and design practices without resolving contradictions, or privileging designers' apparent intentions.[37] In other words, in order to effectively track revelatory and self-aware natureculture practices, one's analytical framework must be amenable to the definitional messiness and ambiguous intent that often accompany such ways of working. And indeed, in this particular history, such openness is crucial: because even as their techniques and methods became more codified, the designers discussed here often continued to operate as sensing practitioners whose tasks were not only to analyze, but also to unfold the materials, sensations, and potentials of site.

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[35] Haraway describes such reciprocity as "alertness to otherness-in-relation"; Pickering refers to it as "open-ended performative dance of agency." Donna Haraway, *The Companion Species Manifesto*; Andrew Pickering, "The Politics of Theory," *Journal of Cultural Economy* 2.1-2 (2009), 197–212.

[36] More recently, works of multispecies ethnography have built on Haraway's precedent, further developing situated theoretical narratives regarding interspecies relationship. See for example, Anna Lowenhaupt Tsing, *The Mushroom at the End of the World: On the Possibility of Life in Capitalist Ruins* (Princeton University Press, 2015).

[37] As Pickering suggests, by seeking to discover what something "wants to do," environmental designers become uniquely able to "establish a *modus vivendi* without ever reaching cognitive mastery," thereby becoming able to engage "the dance of agency without any telos of purification." Pickering, "The Politics of Theory," 203-204.

Building off studies such as these, I elucidate how ethics, politics, histories, and aesthetics can be deeply embedded in designers' choices of drawing implements, uses of eyes and hands, inclusion and exclusion of site data, and understandings of their own roles relative to living forces. I foreground how different design techniques and methods that developed in the United States in the 1960s served to acknowledge, delimit, elide, or exclude various human and natural agencies. I examine ways that designers' rhetoric and making practices folded together: sometimes reinforcing the same conception, other times working against each other to complicate what might rhetorically appear to be a straightforward argument or approach. Lastly, I reveal a complex and shifting set of interconnections between the inner and outer politics of freeway projects: demonstrating how design practices, public actions, and governmental initiatives all evolved together, often in unpredictable and surprising ways.

By integrating STS frameworks and methods into this dissertation, I contribute to STS literatures as well. In analyzing professional practices whose skills are defined by mixing technical clarity and creative exploration, this dissertation raises questions regarding the ways in which self-reflexive naturecultural construction takes place. This in turn extends a range of methodological questions that Haraway and Pickering have each initiated in different ways. How can we analyze skilled practices in ways that recognize the agency of the practitioner who exploratively defines their own practice? And, how can we interrogate skilled practices in ways that are informative to such practitioners today, as they pursue emerging technical innovations, ethical and social challenges, and expanding environmental scales?

Transdisciplinary Histories: Cities, Environments, Technologies, and Design

The third relevant literature engaged in this dissertation is a collection of transdisciplinary histories that extend environmental history's multi-scalar narratives and discussions of hybridity to incorporate urban and technological histories as well. An early catalyst for this mixing was *Uncommon Ground*, a series of influential environmental history essays regarding hybrid landscapes edited by William Cronon.[38] Prompted in part by this collection, a broader environmental history discourse regarding hybridity emerged in the 1990s, with a focus on problematizing nature/culture and nature/technology binaries. Exemplified by the writings of Cronon, Linda Nash, Richard White, and Mark Fiege, this discourse depicts nature and culture as mutually constructed; by extension, it has expanded the territory of environmental history towards more extensive discussions of urban, industrial, and infrastructural topics.[39] Urban environmental histories and histories of infrastructure are two such examples.[40]

Histories of U.S. environmentalism fit here as well, particularly those focusing on the postwar years and later. In charting a history of conceptualizing the environment and defining environmental ethics, the writing of Roderick Nash is foundational.[41] Also relevant is Adam Rome's study of postwar suburban development's influences on the environmental movement,

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[38] Somewhat unusually for environmental history, this volume included a landscape scholar as well: Anne Whiston Spirn discussed the technological aspects of Frederick Law Olmsted's designs. Anne Whiston Spirn, "Constructing Nature: The Legacy of Frederick Law Olmsted," in *Uncommon Ground: Rethinking the Human Place in Nature*, ed. William Cronon (W.W. Norton & Company, 1995), 91-113.

[39] Linda Nash, "The Agency of Nature and the Nature of Agency," *Environmental History* 10 (2005), 67-69; William Cronon, "The Trouble with Wilderness," in *Uncommon Ground*, ed. Cronon, 69-90; Richard White, "From Wilderness to Hybrid Landscapes: The Cultural Turn in Environmental History," *Historian* 66 (2004), 557-64; Mark Fiege, *Irrigated Eden: The Making of an Agricultural Landscape in the American West* (Seattle: University of Washington Press, 1999).

[40] See Christine M. Rosen and Joel A. Tarr, "The Importance of an Urban Perspective in Environmental History," *Journal of Urban History* 20 (1994), 299-310; David E. Nye, *American Technological Sublime* (MIT Press, 1994).

[41] Roderick Frazier Nash, *The Rights of Nature: A History of Environmental Ethics* (Univ of Wisconsin Press, 1989).

concerned as it is with environmentalism and urban regional growth.[42] More thematically influential are recent texts by Barbara Allen, Linda Nash, and Joy Parr that explore twentieth-century tensions between environments and technologies through perspectives of bodily, lived experience.[43] All of these texts identify historical moments of interconnection between environmental movements, social and cultural shifts, urban development, industrialization, commercialization, and governance.[44]

In the wake of environmental history's expansion, a transdisciplinary literature mixing environmental histories and design histories has recently begun to emerge. Diverse studies by Sonja Dümpelmann, Jeanne Haffner, Matthew Gandy, Michelle Murphy, and Thomas Zeller and Christoph Mauch have contributed to a nascent body of work regarding how technologies, infrastructures, landscapes, and the perspectives of people who design and plan them have evolved together in the twentieth century.[45] While this literature is currently small, it is growing.

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[42] Rome's work is largely social, political, and material in focus: it expertly details the significance of suburbanization as an impetus in the environmental movement, and examines the 1970s bureaucratization of environmental issues as well. Although Rome occasionally touches upon both highways and the design professions, including a brief discussion of Ian McHarg's 1970s suburban neighborhood design, he does not discuss either topic at great length. Adam Rome, *The Bulldozer in the Countryside: Suburban Sprawl and the Rise of American Environmentalism* (Cambridge University Press, 2001).

[43] With the exception of Allen, who discusses environmental justice battles, these texts do not center on environmentalism per se; they do, however, productively complicate the notion of agency with regards to human roles in environmental contexts, and environmental impacts on human health. They tend to focus more on everyday inhabitant experiences than on the experiential dimensions of skilled practices. Barbara L. Allen, *Uneasy Alchemy: Citizens and Experts in Louisiana's Chemical Corridor Disputes* (Cambridge, Mass: MIT Press, 2003); Linda Nash, *Inescapable Ecologies: A History of Environment, Disease, and Knowledge* (Univ of California Press, 2006); Joy Parr, *Sensing Changes: Technologies, Environments, and the Everyday, 1953-2003* (UBC Press, 2009).

[44] As is alluded to throughout the following chapters, the freeway revolts and design approaches discussed here engaged and influenced broader 1960s-70s environmental activism. Accordingly, this work does contribute to histories of environmentalism with regards to the visualization of environments, Nonetheless, I primarily focus on urban environmentalism here, in part because the close analyses and comparisons of technique and method that I deploy are more effective when their subject matter is topically consistent.

[45] Sonja Dümpelmann's *Flights of Imagination* and Jeanne Haffner's *The View from Above* both explore connections between technological innovation and ways of seeing, considering how twentieth-century advances in aviation influenced the theorization, planning, and design of cities and landscapes. Matthew Gandy's *Concrete and Clay* describes interrelations between urban infrastructural development, regional

Landscape, design, and technology historians such as Dümpelmann, Kjetl Fallan, and Finn Arne Jørgensen have all called for more studies of how design practices and projects operate within broader movements and systems.[46] The resulting emerging literature, referred to by some as "environmental history of design," is beginning to manifest a range of approaches to illustrating the social, political, and material sources and consequences of design projects, at the metropolitan scale and beyond.

Regarding this dissertation's particular perspective on design technique and method, Murphy's investigation of the late twentieth-century identification of "sick building syndrome" offers a useful analytical framework. Murphy tracks activists', medical professionals', and government workers' efforts to define this new illness, examining the process of defining it as "materialization": a multi-layered, collaborative, iterative transition from imperceptibility into something identifiable and actionable.[47] The notion of materialization offers a unique bridge between STS literature and design history, in that it identifies how small actions defining lived,

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politics, and the material configurations of natural environments in city centers and rural hinterlands. Regarding freeways in particular, Thomas Zeller and Christoph Mauch's *The World Beyond the Windshield* and Zeller's *Driving Germany* detail linkages between the planning and construction of roads, the design of infrastructural landscapes, and broader political and social movements. Sonja Dümpelmann, *Flights of Imagination: Aviation, Landscape, Design* (Charlottesville Virginia: University of Virginia Press, 2014); Jeanne Haffner, *The View From Above: The Science of Social Space* (MIT Press, 2013); Matthew Gandy, *Concrete and Clay: Reworking Nature in New York City* (Cambridge, Mass.: MIT Press, 2002); Christof Mauch and Thomas Zeller, *The World Beyond the Windshield: Roads and Landscapes in the United States and Europe* (Athens, Ohio: Ohio University Press, Stuttgart: Franz Steiner Verlag, 2008); Thomas Zeller, *Driving Germany: The Landscape of the German Autobahn, 1930-1970* (New York; Oxford: Berghahn Books, 2007).

[46] Sonja Dümpelmann, "Taking Turns: Landscape and Environmental History at the Crossroads," *Landscape Research* 36.6 (2011), 625–640; Kjetil Fallan and Finn Arne Jørgensen, "Environmental Histories of Design: Towards a New Research Agenda," *Journal of Design History* 30.2 (2017), 103-121.

[47] Michelle Murphy, *Sick Building Syndrome and the Problem of Uncertainty: Environmental Politics, Technoscience, and Women Workers* (Duke University Press, 2006).

designed spaces cumulatively create broad social and political effects.[48] Murphy's notion of "regimes of perceptibility," meanwhile, highlights how ways of seeing can be politicized in terms of which qualities and characteristics are admitted into environmental representations, and which are omitted.[49]

When testing such framing in the freeway context, multiple contradictions within freeway projects become apparent. In contrast to Murphy's activist subjects, the designers discussed here often did not have coherent political goals. Rather, they tended to position themselves as mediators: between political factions, between humans and landscapes, even between measurement and imagination. In connection to this positioning, the drawing practices engaged in freeway designs were varied in their regimic effects: some were disruptive, while others codified design practices, increasing their bureaucratic effectiveness. Furthermore, in large part due to the tacit and private character of certain drawing actions, qualities that resisted codification and clarification lurked in even the most ostensibly "objective" freeway design techniques and methods. Such complexity highlights this dissertation's unique contribution to the emerging transdisciplinary discourse identified here. By foregrounding subtle ways in which design rhetoric, technique and method defined the environmental cultures surrounding freeway debates, I contribute a markedly practice-oriented perspective to this growing body of work.

Taken all together, these three literatures lay the groundwork for a freeway history at once praxiographic, transdisciplinary, and interscalar in analysis. Architectural and landscape architectural discussions of drawing and making support an articulation of the specific actions

[48] Murphy describes how sick building syndrome was materialized through surveys, studies, and accumulated interviews; in this dissertation, I similarly track how the urban environment was envisioned and made actionable through drawing practices and rhetoric.
[49] Op. cit., 9-10.

through which design practices operate discursively. STS discussions regarding naturecultures and skilled practices provide frameworks for identifying design actions' cultural, political, and material impacts. The transdisciplinary histories that have grown out of environmental history's hybridity discourse, meanwhile, model ways to examine historical design practices at multiple scales and in many modes: material, economic, imaginative, and procedural.

When 1960s freeway controversies and designs are analyzed simultaneously in the bodily-close contexts of technique and method, the broad circumstances of urban politics and disciplinary agendas, and the even broader scales of regional development and governmental politics, a coherently techno-social reading of infrastructural design begins to fall apart, as does a historical interpretation of late modernism as a period when new technologies were deployed towards more objective, rational ends. This dissertation interrogates the messiness underlying that tidier reading of late modernism, towards a more conflicted, partial, and situated understanding of 1960s U.S. design. Building on the three literatures described above, I elucidate complex ways in which design rhetoric, techniques, and methods intersected during this period; examine the dilemmas and choices that designers encountered in public controversies; and reveal how small designing actions could have large political ramifications. I also contribute to these three literatures by demonstrating the historical and theoretical significance of closely examining the mediative, mixed, situated practices of designing.

Analytical Frames and Methods

Together, the literatures described above undergird this dissertation's embedded argument – indeed its working assumption – that designing is a fundamentally cultural, historical, and political activity. Building on that premise, I track several different categories of action in the

chapters to follow. *Naming*, *envisioning*, *computing*, *imagining*, and *activating* offer lenses for analyzing the particular ways in which freeway designing interrelated with freeway politics towards the reconceptualization of living dynamics within cities. I don't always deploy these specific terms in the following chapters; rather, these categories frequently condition the specific subjects and analyses around which each chapter is constructed.

Tracking the actions of *naming* and *envisioning* supports the uncoupling of rhetoric and design process discussed above, enabling me to ask: in what ways did visual and rhetorical approaches to emerging environmental questions align, and in what ways did they conflict? With regards to *naming*, I frequently highlight how specific terms – such as "aesthetics," "environment," "systems," "relationship," the urban "whole," "intuition," and "creativity" – were used by designers, locals, and government officials throughout U.S. freeway debates, to negotiatively identify and nuance definitions of complex urban dynamics.[50] I call out *envisioning* to accentuate how the drawing and making practices innovated through freeway designs presented environmental conditions and qualities not previously manifested on visual terms.[51]

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[50] The terms "aesthetics," "environment," and "ecology" in particular were frequently used to allude to the more metanymic "nature," which was used occasionally, but not frequently in these discussions. Several of these terms, meanwhile, were also used to articulate *holistic* comprehension of the natural, a theme which recurred frequently in urban freeway discourse. None of these terms were new in the 1960s – yet during this period, all were used to mark new ways of seeing and engaging infrastructures and cities. The notion of the urban environment itself was not new among urban designers in this moment: the San Francisco-based Telesis group, for example, began using the term in the 1930s to mark interdisciplinary collaboration in designs for urban realms. Beginning in the mid-1950s, however, some designers increasingly used the term, not only to designate interdisciplinarity, but also as an extension – and partial repudiation – of existing notions of urban aesthetics. See Chapters One and Two for detailed depictions of this dynamic. For an account of tensions at this time between aesthetics and more systematic approaches, see Anthony Raynsford, "Civic Art in an Age of Cultural Relativism: The Aesthetic Origins of Kevin Lynch's Image of the City," *Journal of Urban Design* 16.1 (2010), 43-65.

[51] I frequently call out the *performative* aspects of envisioning, which I define as the ways in which designers socially enact and present the process of design: defining their roles, responsibilities and intentions relative to each other, to publics, and to natural forces. In a slightly different vein, I also sometimes consider the *representational* dimensions of drawings, in order to highlight how presented drawings communicated to viewers.

"Envisioning" is a particularly useful term here. It frames designing as an activity, and simultaneously references both visualization and conceptualization. As such, it reflects the fact that for designers, envisioning is fundamentally intertwined with conceiving of, and intervening in, the world.

Within the broader category of envisioning, two actions are particularly useful to articulating the specific ways that technique and method changed through the freeway debates. During this period, designers integrated novel *computing* practices into design, and also advocated for various forms of *imagining*, sometimes in contrast to computation. I define *computing* broadly here in order to foreground ways in which designers made novel uses of data, measurement, and calculation in their freeway design experiments, often influenced by cybernetic thinking, anticipation of increased computer use in design, and governmental uses of quantification. I use the term *imagining* in order to highlight practices through which designers foregrounded lived experience and constructed living systems as irreducible or otherwise holistic entities. I use *imagining* in part to acknowledge a resonance between this dissertation and recent discussions in the environmental humanities regarding "environmental imaginaries," in which imaginaries denote cultural currency and power.[52]

Imagining and computing played out in myriad ways throughout the design processes examined here. On one hand, freeway design experiments' frequent uses of quantification projected purportedly objective expertise, and retooled design techniques and methods in ways that made them open to standardization and later computerization. At the same time, however,

[52] The term "imaginary" could be seen to undermine a more socially constructivist understanding of design work, in that it suggests that design visions are somehow insubstantial. More broadly, however, this term serves to foreground the culture-making aspects of design practices in a way that is resonant with my larger project here, and also with current discussions in the environmental humanities. See, for example Lawrence Buell, *Writing for an Endangered World* (Harvard University Press, 2009), 18-26.

designers often held onto more traditional techniques for cultivating imaginative relationships to sites, and sometimes invented new ones as well. Relative these dynamics, I investigate: how did designers' technical and aesthetic trainings condition their perceptions of human/environment interactions? Which aspects of freeways and cities did designers seek to measure, which aspects did they depict as immeasurable, and which did they exclude from the design process precisely because they could not be measured?

Lastly, I use the term *activating* to note how freeway design projects constructed the urban environment so that could be acted upon: through design, public protest, governmental initiatives, or legislation.[53] Designers' experimental definitions and visions of freeway sites often directly related to their efforts to make urban environmentalism politically actionable. As such, they frequently shifted and changed the imaginative and computational aspects of freeway projects strategically, so that their proposals would be more effective in public forums and government-driven projects. Throughout the 1960s, the unique mixes of computation and imagination that U.S. designers used to envision urban environments were repeatedly calibrated – sometimes overtly, other times tacitly – in order to activate the very notion of environment: politically, physically, economically, and governmentally.

Reading historical materials for evidence of past actions poses its own unique puzzle, particularly with regard to the work of designing. Tacit actions are, by definition, unspoken: accordingly, in archival research I encountered few detailed accounts of representational techniques and methods. Furthermore, the records of design offices tend to contain more final and written products than process drawings, elide the technical aspects of office and studio work,

[53] Though the term is different, this notion of activation is related to Michelle Murphy's notion of materialization. Murphy, *Sick Building Syndrome and the Problem of Uncertainty*, 1-18.

and omit mention of the many individuals who contributed to projects.[54] Well-known designers' broad narratives regarding the import of their own design work, meanwhile, often manifest generalizations, concerns for reputation, and after-the-fact cultivations of narrative: such documents can problematically obscure the shifting meanings, definitions, and actions that were engaged in the moment of a project's making.

In order to generate praxiographic and rhetorical analyses of these projects, I developed specific research methods, two of which are particularly worth mention. First, I approached designers' written accounts of their work selectively. As I examined written materials for their terminologies and descriptions of design process, I privileged accounts that were closely related to projects over designers' broader narratives regarding the meaning and impacts of their own work. While broader narratives often obscure specific design intents with individual concerns for reputation and legacy, I found that project-oriented texts, when interrelated with other governmental, journalistic, and public documents, often revealed how specific meanings circulated over the course of a project, among all involved.

Second, I developed strategies for tracking uses of technique and method. I analyzed process drawings closely for traces of specific representational actions: frequently relying on my own design knowledge to fill in missing information regarding, for example, the structural qualities of constructed perspectives, or the sensations of using specific drawing materials and implements. I cross-referenced these close analyses of process drawings with a wide range of other archival materials: photographs of office and studio environments, mentions of drawing activities within written and oral histories, project records, funder reports, journal articles,

[54] Steven Shapin details this this problem with regards to scientific research, noting the "double invisibility" of technical assistants, whose roles are often elided first in scientific articles, and then later in historical accounts. Steven Shapin, "The Invisible Technician" *American Scientist*, 77.6 (1989), 554-563.

meeting notes and transcripts, correspondence, and syllabi. Such materials enabled me to verify and nuance the practices that I identified through my analyses of process drawings.

The challenges and successes of this research demonstrate that certain kinds of researcher knowledge and archival material are particularly important to practice-oriented and plural accounts of design projects. My own landscape architectural training was invaluable in deducing the actions of making drawings.[55] With regard to archival materials, process drawings were clearly essential to this project: without them the following accounts would not have been possible. I was fortunate to find such drawings, and the extensiveness and organization of certain archives – Lawrence Halprin's in particular – were invaluable in this regard.[56] Oral histories were also highly useful: their conversational character meant that mentions of office practices were far more frequent than they were in more formal accounts. The continued availability of archival materials such as these will be crucial to the future feasibility of praxiographic studies such as this one.

Chapters and Structure

Each chapter centers on a different freeway design project conducted from the late 1950s through the late 1960s, by a team composed of landscape architects, urban planners, architects, and/or engineers. Each project involved experiments in rhetorically or visually redefining freeways and cities on environmental terms. None of these projects resulted in built freeways:

[55] With trained designers increasingly engaging doctoral study today, it is possible that practice-oriented historical analyses will become more prevalent in the near future.

[56] Halprin was, in fact, quite interested in building his legacy: he was strategic in retaining and organizing project materials for much of his career, such that his extensive collection arrived at the Architectural Archives of the University of Pennsylvania already well organized. Halprin's care in this regard points to the significant role of the designer's own agenda in determining their historical legacy; at the same time, it demonstrates that an individual designer's decision to leave such an extensive record of their office's work enables historians to counter traditional heroic, individualized narratives with more plural and social accounts.

some were purely theoretical, some were not approved by protesting publics, some were intended to stop routes from getting built in the first place. The fact that these projects remained unbuilt is useful here: because they existed only in analyses and proposals, they offer uniquely appropriate case studies for considering the real-world ramifications of design drawing and making.

Each project engaged a different urban region, scale, and approach to envisioning freeways and their surrounds. The chapters are not exactly chronological, but in general they do move forward in time. They also move up in scale: from neighborhood, to city, to exurban/metropolitan region, to a series of generalized recommendations for all U.S. cities. This order reflects shifts in urban and environmental design approaches through the 1960s, from traditional modernist site design towards increasingly systematic, large-scale depictions of abstracted forces and flows.

In each chapter I keep biographic narratives brief, so that I can center not on individual designers, but on the projects in which they participated. I fold together close analyses of design technique and method with investigations of project intentions and outcomes, and designers', protesters', and government officials' actions and discussions. To unearth intentions and outcomes I integrate information regarding project chronologies, site histories, social contexts, the attitudes of clients and funders, and political controversies, as well as designers' project goals, intellectual positions, and broader professional and disciplinary ambitions.[57] To examine rhetoric, I track different actors' written and spoken references to terms that marked emerging

[57] I sometimes discuss designers' intentions in this dissertation, but often describe their actions without assigning intentionality. When I do discuss designers' intentions, I tend to juxtapose them against close descriptions of the actions of designing. I also largely forego discussions of designers' broader discourses regarding their professions, in order to focus instead on the rhetoric that designers used when discussing the projects themselves. This narrows the field of discussion with regards to designers' bodies of work, and decenters designers' own stated agendas relative to their projects.

conceptions of the urban at this time: as mentioned above, terms such as "aesthetics," "environment," "relationship," and "ecology." To reveal specific design practices, I closely describe drawings' underlying techniques, reference written and oral history mentions of drawing activities, and examine designers' pedagogical influences.

Chapter One provides historical context for 1960s freeway designs and discussions of the "urban environment" in the United States: tracking various projects, events, discussions, and movements from the late 1800s-on that would influence the specific ways that designers later approached freeways. Included in discussion are U.S. parkway designs of the late 1800s-1930s; the 1930s invention of the term "freeway" and related writings and projects of the Regional Planning Association of America; the turn towards European avant-garde modernism that took place at several design education institutions beginning during the Second World War; the rise of cybernetics and computer research after the war; and conflicts between local, state, and federal levels of governance that would contribute to the circumstances of the 1960s freeway revolts. All of these diverse influences would converge in the projects detailed in the following chapters, in generative, conflicting, and sometimes unexpected ways.

Chapter Two details Lawrence Halprin and Associates' 1962-64 design work for the California Division of Highways on the Panhandle Freeway, a portion of San Francisco's freeway plan that was fought locally in one of the nation's first freeway revolts. Tracking various arguments for and against freeways through the Halprin team's drawings and writings, state highway engineers' responses, and local protestors' actions and arguments, this chapter details how the very concept of the urban environment evolved throughout the Panhandle Freeway design and debates. Halprin and his team would promote this evolution in writing and discussion, but never fully integrate it into their design approaches; they therefore both contributed to – and

were criticized by protestors for resisting – local conceptions of freeway environments. These public perceptions would influence Halprin's design practices significantly in the following years; the broader vision cultivated in the Panhandle debates, meanwhile, would contribute to a rapid growth of anti-freeway and pro-environment perspectives in cities throughout the United States.

Chapter Three focuses more fully on technique and method, analyzing Donald Appleyard, Kevin Lynch, and John Myer's 1956-1964 methodological and visual experiments for their book on freeway design, *The View from the Road*. The team drew on their modernist training to explore the sensory dimensions of freeway driving, engaging the "urban environment" as a matter of spatial experience. They took urban freeways' massive scale, interrelational complexity, and synoptic vantage points as opportunities for inventing a novel series of design techniques and methods that were both inclusive and reductive: in turns situated, data-oriented, purportedly objective, and experientially holistic. Meanwhile, underlying the team's ambitious design innovations was a problematic elision of their own political positioning; one that would ultimately undermine the efficacy of their approach amidst the heightening freeway politics of the 1960s.

Chapter Four examines the representational innovations developed in three versions of a computational method for analyzing potential highway location. The first two approaches, by engineer John Roberts, and by architect Christopher Alexander and engineer Marvin Manheim, were theoretical; the third, led by Ian McHarg, was a real-world project for residents of Princeton, NJ protesting a proposed routing of Interstate 95 through their township. Tracking the overt and tacit rhetoric, techniques, and methods with which the Alexander/Manheim and McHarg teams altered Roberts' original precedent reveals numerous integrations of aesthetic, interrelational,

and performative characteristics into what was originally a technical cost-analysis approach. The resulting quantitative/qualitative mixings generated productive instabilities, enabling both design teams to innovatively invoke, envision, and defend highway sites on environmental terms. In the I-95 case, these instabilities proved politically efficacious in governmental contexts: contributing to a redefinition of "the environment" not only as a complex living system, but as a political entity as well. McHarg and others would capitalize on this effectiveness in the following years; as a result, Roberts' highway location method would catalyze a new, bureaucratically oriented approach to environmental planning and design.

Chapter Five describes an instance between 1966-1968 when the Federal Highway Administration sought the input of an advisory board composed of architects, planners, landscape architects, and engineers regarding how to minimize the controversial social and environmental costs of urban freeway design and construction. The result was *The Freeway in the City*, a book of recommended freeway design practices geared towards highway engineers, which glorified a "systems approach" to freeway design as a political and environmental cure-all. Throughout their discussions, correspondences, and book production, the advisors repeatedly chose to engage freeways in delocalized ways; advocating for design expertise and urban environmental concerns on conceptual terms, and with abstracted diagrams. This approach proved fraught in practice and ultimately ineffective; meanwhile however, the tensions manifested in their process presaged upcoming transformations in both governmental and countercultural environmentalism.

Together, these chapters illustrate the particular, shifting character of U.S. design professions in the 1960s with regards to scale and character of projects, the role of governments in urban and regional development, the rise of urban political environmentalism, and an increase

in systems thinking and computerization. With regards to designing in particular, these projects demonstrate a gradual shift away from experiential approaches towards more abstracted ones: from traditional uses of plan, section, and perspective to define spaces, to experimental diagrammatic notations based on novel uses of quantification, to plan-based regional mappings of geographic conditions, and lastly to highly abstract diagrams representing systems-based views and principles. Accordingly, these chapters track the identification and differentiation of the urban environment as something dynamic and living; and then, as the 1960s continued, as something increasingly definable, quantifiable, and politically actionable relative to public debates and government legislation.

In its broad outline, this shift would appear gradual, smooth, and coherent. However, when viewed at close range, this history is in no way a tidy tale. Fine-grained analyses reveal a range of partial, multiplicitous, and contradictory practices that never entirely resolved into coherence. This history therefore demonstrates new ways of seeing and working in messy, conflicted formation.[58] Such messiness is apparent in ways that the term "environment" was used at different times to mark social dynamics, ecological processes, visual aesthetics, communitarian values, and mechanistic relationships. It is also identifiable in the ways that design drawing and making practices often manifested anti-regimic qualities, disrupting and complicating what rhetorically appeared to be coherent or unified narratives.[59] Indeed, even as designers tested and

[58] Indeed, throughout this period, design and planning disciplines were changing fast. Such change was exemplified in this period by the development of urban design, environmental design, and ecological design as distinct practices; numerous attempts to redefine built environments on new rhetorical and visual terms; novel efforts to embrace science as a source of disciplinary expertise and authority; explorative integrations of data into design methods; and experimentation with computers.

[59] I use this term in reference to Michelle Murphy's "regimes of perceptibility," which she uses to identify the political dimensions of exclusions and inclusions – literally the making im/perceptible – of various environmental entities and conditions. While such inclusions and exclusions were engaged in the following freeway projects, some of the drawing practices innovated here tended to multiply, rather than

promoted overtly computational approaches, they nonetheless continued to harbor experiential, qualitative, imaginative practices as well. In discussing design projects on praxiographic terms, I demonstrate the many ways that different aspects of the same project aligned and conflicted, and in doing so, complicated the social, cultural, and political outcomes of designing.

The design practices detailed in this dissertation epitomize the era's broader tensions regarding how to conceive of U.S. cities on dynamic, lived terms; whether environments were functional, quantifiable systems or transcendent, immeasurable wholes; and how to come to terms with urban sites so extensive and complex in their interrelated components that they were exceedingly difficult to grasp. Issues such as these influenced the forms that environmentalism would take in the following years, as efforts to protect natures developed hand-in-hand with endeavors to digitize, legitimize, manage, and quantify that protection. Within that broader trend, these projects are informative in their unique efforts to understand, dialogue with, and defend natural forces at enormous scales and levels of complexity – scales that demanded radically new ways of computing, drawing, and seeing. Furthermore, these projects reveal the inherent challenges of designing infrastructures, cities, and regional landscapes: entities so multi-agentic, dynamic, and massive that they cannot be wholly captured in a single term, within the edge of a drawing, or even through a bevy of statistics and measurable data. In practice in the 1960s, the urban environments of freeways repeatedly – and often uncontrollably – exceeded their frames.

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consolidate, understandings of freeways and cities. Murphy, *Sick Building Syndrome and the Problem of Uncertainty*, 1-18.

CHAPTER ONE

FREEWAY + ENVIRONMENT + DESIGN = ?

> Planning is *discovery* and not invention. It is a new type of exploration. Its essence is visualization – a charting of the potential now existing in the actual.
>
> - Benton MacKaye, "Regional Planning and Ecology," 1940[1]

> In highways, then, lies a new national frontier for the pessimist who thinks frontiers have disappeared.
>
> - Paul G. Hoffman, President, Studebaker Corporation, 1940[2]

For a brief time in the 1960s, a handful of freeway design projects engaged a markedly integrated notion of how humans and natures relate within cities. Envisioning the urban milieu as something both experiential and systematic, these designs presented cities as realms at once abstract and lived, networked and spatial, measured and sensed. In their specific techniques and methods, the projects' designers modeled responsive interconnection with larger natural systems, situating themselves as subjects within the urban system that they sought to design. Undergirding this unique integration was a conception of the "urban environment" as something fundamentally hybrid: simultaneously technological and natural.[3]

What conditions made it possible for freeways, urban designers, and hybrid notions of the "urban environment" to become entangled in this way? In this chapter, I will briefly recount how several decades of urban design, planning, and development created the circumstances for the 1960s freeway debates. I will touch upon relevant projects, controversies, and events in the

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[1]Benton MacKaye, "Regional Planning and Ecology," *Ecological Monographs* 10.3 (1940), 349-353.
[2] As cited in Mark H. Rose and Raymond A. Mohl, *Interstate: Highway Politics and Policy Since 1939* (Knoxville: University of Tennessee Press, 2012), 1.
[3] For more on the concept of hybridity as defined by environmental historians, see Chapter One.

design & planning disciplines, paying particular attention to expanding governmental funding and oversight, emerging new technologies, and popular environmentalism. I will foreground how various ideas of cities, technologies, and natures circulated during this period, and how such ideas were visualized on qualitative and quantitative terms.

In doing so, I will elucidate some of the many factors that would influence 1960s designers' approaches to envisioning freeways and conceptualizing cities as environments. From the late nineteenth century until the 1960s, cities and natural environments were understood sometimes as opposing entities, other times as interrelated ones. An increasingly technologized and bureaucratic notion of urban nature emerged during these decades, as highway engineers and designers increasingly defined living urban systems as economically and statistically quantifiable complexes of working parts. At the same time, some designers cultivated more holistic, qualitative visions for urban development, advocating design approaches that exceeded a strictly sum-of-parts understanding of urban nature. In these ways, the years preceding the freeway debates established a basis for 1960s designers to imagine new ecological approaches to design, and to develop novel means of envisioning urban milieus as interrelational environments at once human, technological, and natural.

Although the chapters following this one involve a fine-grained examination of design discourse and practices, this chapter forgoes practice-oriented analyses in favor of a broader history of urban roadway planning and design in the United States. I chart trends generally here, in order to lay groundwork for the closer examinations to follow.[4] The ways that designers and

[4] Although this dissertation as a whole is largely concerned with design rhetoric, technique and method, in this chapter I will primarily discuss significant events, project outcomes, and broad social and political trends. I will reserve investigations of drawing and making practices for upcoming chapters, which prioritize close attention to individual projects.

planners engaged large themes regarding nature, technology, and the environment from the late 1900s through the postwar years would play out in the specific practices that designers would explore in the 1960s, especially with regards to balancing qualitative and quantitative approaches to the design of urban freeways, and to the politics of designing relative to evolving notions of urban environments.

Late Nineteenth Century Through the 1930s: From Parkways to Freeways

From the late nineteenth century through the years leading up to the Second World War, urban roadway layout and design was largely the work of landscape architects, architects, and urban planners.[5] Urban roadway representations during these decades included visions of pastoral landscapes and gleaming modern cities, as well as quantitative analyses that represented cities on more mechanical terms. During this period design and planning approaches oscillated between parkway pastoralism and technological futurism, resulting in a range of perspectives regarding the degree to which cities were natural or technological in character.

The "park-way" was invented in 1868, when Frederick Law Olmsted and Calvert Vaux used the term to describe carriage approaches they had designed for Prospect Park in Brooklyn, NY.[6] In the following decades, designers such as Olmsted and Daniel Burnham and Edward Bennett extended parkways further into cities and metropolitan areas, proposing that networks of

[5] Several works recount different aspects of this broad history. Timothy Davis has charted the history of parkway design in the United States. Christopher Wells' environmental history of U.S. roads describes how automobility fundamentally altered peoples' relationships to the natural world. Mark Rose and Raymond Mohl recount government initiatives, planners' efforts, and political negotiations surrounding highways, beginning in the late 1930s. Joseph DiMento and Cliff Ellis cover the same time period, with a focus on urban freeway debates. Timothy Davis, "The American Motor Parkway," *Studies in the History of Gardens & Designed Landscapes* 25.4 (2005), 219-249; Christopher Wells, *Car Country: An Environmental History* (Seattle: University of Washington Press, 2012); Rose and Mohl, *Interstate*; Joseph F. DiMento and Cliff Ellis, *Changing Lanes: Visions and Histories of Urban Freeways* (Cambridge, Mass.: MIT Press, 2013).

[6] Davis, "The American Motor Parkway," 220.

these verdant carriage roads could simultaneously provide routes for efficient travel throughout urban regions, and integrate a framework of green spaces into the urban fabric.[7] Reflecting the rapid industrialization of cities in this period, drawings such as Burnham and Bennett's 1909 Plan of Chicago (Figure 1.1) depicted the future city as something both organic and machinic: a vast, complex network comprised of multiple systems, with extensive sinuous landscapes at Chicago's edges becoming increasingly ordered towards the urban center as their forms were integrated with the city's gridded geometry.

After the rapid rise of automobile use in the first decades of the twentieth century, the parkway became the predominant model for badly needed new urban-area road systems.[8] Like their carriage-oriented predecessors, automobile parkways were designed for uninterrupted traffic flow, with periodically spaced entry points and densely planted surrounds. This layout was both more efficient and more amenable to popular leisure driving than the frequent intersections and varied frontages of city streets and highways. The Westchester County parkway system, designed by landscape architect Gilmore Clarke, was one of the earliest regional

[7] Olmsted's 1870s design for Boston's "Emerald Necklace" used parkways to link a series of city parks. Burnham and Bennett's 1906 plan for San Francisco and 1909 plan for Chicago extended this approach. Like the Emerald Necklace, the San Francisco and Chicago plans were designed predominantly for carriages. In the first decade of the twentieth-century automobile use was rising but still modest; Burnham and Bennett did not anticipate that their use would explode in the coming years. Daniel H. Burnham and Edward H. Bennett, *Report on a Plan for San Francisco: A Facsimile Reprint of the 1906 Plan* (Berkeley, Calif.: Urban Books, 1971); Daniel H. Burnham, Edward H. Bennett, and Charles Moore, *Plan of Chicago* (New York: Princeton Architectural Press, 1993; originally published, Chicago: Commercial Club, 1908). See also Samuel Kling, "Wide Boulevards, Narrow Visions: Burnham's Street System and the Chicago Plan Commission, 1909–1930," *Journal of Planning History* 12.3 (2013), 245–268.

[8] Between 1910 and 1920, roughly eight million new Model T's were released onto U.S. roads, prompting extensive debates between governmental agencies and interest groups regarding traffic regulation and control. Improving existing carriage roads was often the most efficient and cost-effective approach to increasing automobile capacity, yet this often resulted in traffic congestion and inefficient routes. Wells, *Car Country*, 35-38, 65-104.

parkway networks.[9] Because these roads involved extensive landscape planning, design, and construction and were associated with parks and leisure, landscape architects were frequently in charge of their creation. Images such as Figure 1.2 show the degree to which such roads were treated like park landscapes: with broad lawns and large trees mediating between the pavement and its surrounds, and aesthetic treatment of bridges and utilities.

When it came to fitting high-speed roadways into dense urban contexts, however, broad swaths of landscape were increasingly seen as too expansive.[10] For these settings, planners and traffic engineers proposed more stripped-down designs that would require less disruption to existing conditions. The generous verges of earlier designs were replaced by visions of, for example, narrow planted medians in the 1924 Detroit "superhighway" plan (Figure 1.3), and an elevated railway-inspired highway in the 1930 *Report on a Thoroughfare Plan for Boston* (Figure 1.4).[11] These proposed roads were utilitarian in both structure and method: their concrete and steel forms contrasted the vegetated aesthetics of parkways, while their feasibility was increasingly tested through data-driven analyses of existing and anticipated traffic needs.[12]

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[9] The Bronx River Parkway in Westchester County, NY was the first "limited-access automobile highway" in the country to start construction, in 1907. For more on Clarke and the Bronx River Parkway, see Davis, "The American Motor Parkway"; Randall Mason, *The Once and Future New York: Historic Preservation and the Modern City* (University of Minnesota Press, 2009), 177–231; Thomas J. Campanella, "MOTORElysium: Gilmore Clarke and the Garden for the Machine," *Colloqui: Cornell Journal of Planning and Urban Issues* 6 (1991), 1–11.

[10] For more on a parkway's effects regarding development and displacement, see Mason, "Bronx River Parkway."

[11] *Proposed Super-Highway Plan for Greater Detroit* (Detroit MI: Rapid Transit Commission, 1924); Robert Harvey Whitten, *Report on a Thoroughfare Plan for Boston* (Boston Mass.: City Planning Board, 1930). See also: *Regional Plan of New York and Its Environs, Volume I: The Graphic Regional Plan* (New York: Committee on the Regional Plan of New York and Its Environs, 1928)**;** DiMento and Ellis, *Changing Lanes*, 23-44. On Chicago's 1927 West Side Super-highway plan, see Kling, "Wide Boulevards, Narrow Visions," 259-262.

[12] Regarding 1920s-30s uses of data to evaluate urban traffic needs, see Jeffrey Brown, "From Traffic Regulation to Limited Ways: The Effort to Build a Science of Transportation Planning," *Journal of Planning History* 5.1 (2006), 3–34.

From the beginning of the Great Depression through the end of World War II, highway construction mostly stalled, but planning continued. During this period, parkway and utilitarian models diverged further. Designers, planners, and advocates such as John Nolen, Henry Hubbard, Benton MacKaye, and Lewis Mumford promoted parkway models, as did the U.S. Bureau of Public Roads (BPR).[13] In contrast, planner Edward Bassett and New York commissioner Robert Moses each advocated for utilitarian alternatives to parkways: limited-access, high-speed roadways stripped of their park edges and associations. A handful of such highways, such as the West Side Highway, were built in New York City at this time (Figure 1.5).[14] Basset argued that this new form of highway would serve to separate utilitarian traffic from parkways' leisure-based uses. To identify this new road type, he coined the term "freeway."[15] From this point forward, freeways would be understood as infrastructurally utilitarian highways in urban contexts.[16]

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[13] Nolen and Hubbard used economic data to demonstrate that parkways often boosted regional prosperity. The BPR avidly promoted the parkway-based Mt. Vernon Memorial Highway as a model for future highway networks. According to Davis, the BPR named this road as a highway to suggest that highways should be built on a parkway model. John Nolen and Henry Vincent Hubbard, *Parkways and Land Values* (Harvard University Press, 1937); Davis, "The American Motor Parkway," 225-231. Regarding MacKaye and Mumford's idea of the "townless highway," see Benton MacKaye and Lewis Mumford, "Townless Highways for the Motorist," *Harper's* (1931), 347–356.

[14] In implementing the 1929 *Regional Plan of New York and Environs* (RPNYE), Moses promoted highly engineered trafficways such as the West Side Highway. Many of these highways were designed by Gilmore Clarke and Michael Rapuano, whose firm Clarke & Rapuano worked with Moses for several decades beginning in the mid-1930s. DiMento and Ellis, *Changing Lanes*, 36-41. See also Matthew Gandy, *Concrete and Clay: Reworking Nature in New York City* (Cambridge, Mass.: MIT Press, 2002), 115-152.

[15] Basset argued for limited use of the parkway model, based on separation of leisure-oriented uses from utilitarian ones. In "The Freeway – a New Kind of Thoroughfare," he proposed three types of high-speed trafficways: the parkway, recreational in purpose with no frontage for private property; the highway, utilitarian in purpose with mixed private frontage; and the freeway, utilitarian in purpose but like the parkway in its lack of frontage. Edward Murray Bassett, "The Freeway-A New Kind of Thoroughfare," *The American City* (Feb. 1930), 95. See also Edward M. Bassett and Malcolm H. Dill, "Freeways Versus Highways: Discussion," *Journal of the American Institute of Planners* 3.4 (1937), 106–107.

[16] Although Basset's "freeway" and the term "expressway" both denote urban limited-access high-speed roadways, in this dissertation I primarily use the term "freeway," in keeping with historical planning discourse, prevalent 1960s terminologies (e.g. the "freeway revolts"), and recent scholarship (see

Contrasts between parkway and freeway visions for road networks were further clarified in 1939, on the eve of the United States' direct involvement in World War II. The first federal plan for a nation-wide network of interregional highways, *Toll Roads and Free Roads*, was published in that year. It contained a broad overview of proposed highways nation-wide (Figure 1.6), extensive statistical analyses of existing and anticipated interstate traffic volumes (Figure 1.7), and standards for highway layouts and construction.[17] The document's mostly analytical imagery was complemented by a handful of hazy aerial renderings showing curving highways gently arcing past town centers (Figure 1.8). The resulting model for representing highways – as geographically abstracted, predominantly quantitative, and tempered by occasional aesthetic imagery – would soon become a standard way to represent highway plans at federal and state levels. As it became more prevalent, this approach would pose significant problems in later decades regarding how to understand freeways' impacts on the ground and at the urban scale.[18]

Also in 1939, two exhibits at the World's Fair in Flushing, Queens presented markedly different urban roadway models.[19] In the General Motors Futurama exhibit, product designer Norman Bel Geddes displayed a technological vision of urban regions reminiscent of Corbusier's Radiant City, with tall, tidy urban towers surrounded by a massive concrete carpet of vertically

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DiMento and Ellis, *Changing Lanes*). I use the more generic term "highway" when discussing high-speed roadways more generally, and also when the roads discussed were either not urban, or not limited access.

[17] *Toll Roads and Free Roads: Message from the President of the United States Transmitting a Letter from the Secretary of Agriculture, Concurred in by the Secretary of War, Enclosing a Report of the Bureau of Public Roads, United States Department of Agriculture* (Washington: U.S. Govt. Print Office, 1939).

[18] This issue emerges to some degree in all of the following chapters; it is most apparent in Chapter Five.

[19] The fair ran from the spring of 1939 through the fall of 1940, during which time a total of 44 million people attended (at this time the United States had a population of roughly 130 million). Geddes' Futurama ride was the most visited attraction. For more on the contrasts between Bel Geddes' view and the RPAA's, see Cliff Ellis, "Lewis Mumford and Norman Bel Geddes: The Highway, the City and the Future," *Planning Perspectives* 20.1 (2005), 51–68.

layered multi-lane freeways (Figure 1.9).[20] A few pavilions over, the Regional Planning Association of America (RPAA)-coordinated film "The City" argued for limiting highway infrastructures in favor of pedestrian-oriented communities and regional open space networks, in order to enhance urban-area quality of life and community cohesion.[21] These projects codified the previous decades' contrasting approaches with two vivid, opposing visions of urban freeway futures: one technologically futuristic, the other bucolic and pastoral. Oppositional as they were, however, they both shared one core premise: that highways were central to urban futures.

The 1930s: New Approaches to Design and Nature

Geddes' and the RPAA's exhibits reflected a growing recognition in the interwar years that regional highway systems, urban growth, and city dwellers' ways of living were intrinsically interrelated. The RPAA's advocacy of parkway models arose from its members' observations that increased automobility was leading to rampant regional development. The RPAA was part of a broad 1930s regionalist movement. Inspired in large part by British regionalism, planners,

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[20] Visitors rode on automated seats, looking down on a large model of landscape and city. The fact that Bel Geddes was a product designer undoubtedly conditioned his approach to city design; Robert Moses criticized Bel Geddes for promoting an urban vision without considering real-world function. Le Corbusier's highway-centered urban plans of the 1920s inspired many structural approaches to highway design in the US, beginning in the 1920s and increasing in the 1930s with the reproduction of his urban plans in *Architectural Record*, and the 1933 publication of *The Radiant City* in the United States. Adnan Morshed, "The Aesthetics of Ascension in Norman Bel Geddes's Futurama," *Journal of the Society of Architectural Historians* 63.1 (2004), 74-99; Carol A. Hagan, "Visions of the City at the 1939 New York World's Fair" (PhD diss., University of Pennsylvania, 2000), 109-110. Ellis, "Lewis Mumford and Norman Bel Geddes."

[21] The film was conceived by RPAA members Catherine Bauer Wurster and Clarence Stein, created by Pete Lorenz, and narrated by Lewis Mumford. It contrasted verdant images of landscaped communities against rapid-fire montages of crowded roadways and polluted industrial slums, closing with idyllic scenes of people strolling and playing in Greenbelt, MD, a Federal Resettlement Administration development whose layout and design were created with Stein's advisement. The film extolled Greenbelt's separation of car and pedestrian traffic, and its definition of neighborhoods via walkable paths and broad swaths of green space. Kermit C. Parsons, "Collaborative Genius: The Regional Planning Association of America," *Journal of the American Planning Association* 60.4 (1994), 462–482. Regarding the design of Greenbelt, see Kermit C. Parsons, "Clarence Stein and the Greenbelt Towns: Settling for Less," *Journal of the American Planning Association* 56.2 (1990), 161-183.

designers, and conservationists in many U.S. cities advocated for thoughtful planning of urban-area growth, including designation and protection of regional greenbelts and greenways.[22]

Led by Clarence Stein, the RPAA was a small cluster of like-minded intellectuals, designers, and planners concerned with the future development of urban regions.[23] In the 1920s-30s and beyond, their collaborations focused on ameliorating the negative effects of metropolitan industrialization and commercialism, such as pollution, loss of green space, and loss of community cohesion. They argued that the arrangement of regional open spaces, infrastructures, industries, commerce, and private property directly impacted the wellbeing of city-area dwellers.[24] To promote higher qualities of life for residents in urban regions, the group advocated for regional development patterns that aggregated multiple small pedestrian-oriented communities within an abundant network of open space.

[22] This movement grew during a period when urban planning was becoming established as a profession in the United States. For reference, the first urban planning program in the United States opened at the Harvard GSD in 1923.

[23] The primary members of the RPAA were Clarence Stein, Benton MacKaye, Lewis Mumford, Alexander Bing, Henry Wright, and Catherine Bauer Wurster. The group was formed in 1923 and officially disbanded in 1932, but several members continued regular correspondence and occasional collaboration well after that date. Clarence Stein and Henry Wright realized RPAA ideals in built form, working together (and with others such as landscape architect Marjorie Sewell Cautley) on neighborhoods such as Radburn, NJ, that placed open space at the center and automobile traffic at the periphery. I focus primarily on RPAA members' 1930s work here, since this is the period when they collaboratively discussed highways, and when they worked on the regional vision that would influence later generations of urban designers. Mumford would also continue writing and engaging politically regarding highways in later decades. See, for example, Lewis Mumford, "The Highway and the City," *Architectural Record* (April 1958), 179-186; Lewis Mumford, "Traffic vs. Balanced Environment." *Landscape Architecture* (1958), 241. For general overviews of the RPAA's work, see Parsons, "Collaborative Genius"; Matthew Dalbey, *Regional Visionaries and Metropolitan Boosters: Decentralization, Regional Planning, and Parkways during the Interwar Years* (Boston: Kluwer Academic Publishers, 2002).

[24] This idea, of course, was not new in itself; Olmsted's public health approach to park design is a clear precedent. The RPAA extended this idea, however, to include the layout of entire regions.

The RPAA's model of urban/nature relationships would significantly influence later 1950s-60s environmental approaches to freeway design.[25] In accordance with their larger vision, RPAA projects often framed automobile traffic and new roadways as both symptoms and catalysts of metropolitan growth problems; in this light, MacKaye and Mumford developed a parkway-oriented "townless highway" idea with the intention of curtailing automobile traffic's negative effects on human health and wellbeing.[26] More broadly, RPAA members – along with other regionalists – saw the highway as one of many structuring elements within the urban area whose interrelations defined the quality of urban life. They thereby conceptualized the region as a complex milieu composed of active, complex relationships among its living and material parts.[27]

This notion of the city as a large, dynamic, living system would be central to 1960s freeway projects, and to the environmental movement more generally, particularly with regards to containing suburban development from the postwar years through the 1970s.[28] Mumford's writings especially would become central to later environmentalists working against rampant suburban development. [29] Furthermore, regional greenbelt conservation movements inspired by

[25] There are, of course, other significant urban design influences on open space planning that are not discussed here, such as individual precedents set by Clarke, Nolen, and Olmsted, and others. Some of these will be referenced within the following chapters.
[26] In "Townless Highways for the Motorist," MacKaye and Mumford decried the rampant growth of roadside commercial development and advocated for high-speed limited-access parkways linked with regional open-space networks. MacKaye and Mumford, "Townless Highways for the Motorist."
[27] The most direct example of this is MacKaye's association of regional planning with the terms "environment" and "ecology," and his proposal that the work of the planner was to visualize material and living forces and flows. More generally, this manifested in the RPAA's working premise that urban development was experientially, economically, socially, and materially tied to broader patterns in the natural world. MacKaye, "Regional Planning and Ecology."
[28] For a detailed, multi-layered account of the ways that rampant suburban growth catalyzed the environmental movement from the postwar years through the 1970s, see Adam Rome, *The Bulldozer in the Countryside: Suburban Sprawl and the Rise of American Environmentalism* (Cambridge University Press, 2001).
[29] Although the relevance of Mumford's writings to twentieth-century environmentalism in the United States is well established, the regionalist movement in which he participated is less regularly cited as a

the RPAA, such as the Telesis group's collaborations with the Sierra Club, would establish precedent for 1960s environmental organizing and discourse, especially with regard to crafting regional development plans that would ensure the conservation of open space.[30]

When 1960s designers looked to the RPAA for inspiration, however, they would inherit not only a model for understanding and planning cities as complex hybrid entities, but also a series of conflicts in RPAA projects and ideologies. One such conflict involved whether technological advancement and urbanization were inherently threatening to nature, or fundamentally natural in their own right. On one hand, Mumford saw the rapid growth, commercialization, and industrial production of the existing city as a threat to the natural world and a more harmonious way of living: his broad treatises about the workings of urban regions tended towards depicting cities as rampant destroyers of the countryside.[31] MacKaye, in contrast, characterized urban regions – and material and technological forces more generally – as essentially environmental in character.[32]

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strong influence on U.S. environmentalism: some histories of environmentalism do discuss the movement's role, while others do not.

[30] For more on Telesis, see Chapter Two.

[31] In *The Brown Decades*, Mumford starkly presented cities as threats to rural values, lifestyles, and landscapes. In "What is a City?" he celebrated urban culture, but criticized existing patterns of urban growth. Some of these sentiments were critiques of the Metropolitan model – and yet given that industrialization and the twentieth-century U.S. city were so intrinsically intertwined, Mumford's critique of the industrialized city also often reads as a broad association of urbanism with environmental devastation. Lewis Mumford, *The Brown Decades: A Study of the Arts in America, 1865-1895* (New York: Harcourt, Brace and Company, 1931); Lewis Mumford, "What Is a City," *Architectural Record* 82 (1937), 59–62.

[32] MacKaye, in fact, used the very term "environmental" in his writings. Though mostly working on broad regional projects such as the Appalachian Trail and the Tennessee Valley Authority, MacKaye wrote conceptual treatises on urban and regional planning during this period as well. Keller Easterling has noted that, along with Aldo Leopold, he was one of the earliest public intellectuals to embrace the term "environment." Easterling has also detailed ways in which MacKaye saw industrial and ecological processes to be similar. Keller Easterling, *Organization Space: Landscapes, Highways, and Houses in America* (Cambridge, Mass.: MIT Press, 1999), 17, 39-43. See also Ben A. Minteer, *The Landscape of Reform: Civic Pragmatism and Environmental Thought in America* (MIT Press, 2006).

Describing planning as a form of "human ecology," he suggested that the city was a form of nature in its own right.[33]

Later urban design approaches would also be influenced by notable lacunae within RPAA work.[34] For despite ambitious ideological propositions regarding the planning and design of urban regions, RPAA members never worked on real-world highways or other urban networks.[35] MacKaye and Wright each experimented with environmental visualization for entire states and sometimes multi-state regions (Figure 1.10).[36] Stein, meanwhile, desired to expand beyond the neighborhood scale, but never succeeded in doing so. In following decades, then, later generations of urban designers influenced by RPAA figures' writings and projects would encounter a gap between their outspoken, well-defined promotions of environmental approaches

[33] Although I do not discuss sociological work in human ecology in this dissertation, it should be acknowledged nonetheless that MacKaye's mentions of the term "ecology" were likely resonant with that school of thought. In the 1920s-30s, "Chicago School" sociologists conceptualized "human ecology" as a matter of urban community organization. The ways in which Chicago School sociologists conceived of urban ecology as a matter of human social life is certainly relevant throughout this dissertation, and there is much to be said on how their uses of biological notions of ecology to describe human social structures influenced broader discourse on the character of urban nature. However, because Chicago School work does not appear to have been a central influence on any of the design projects discussed in the following chapters, I do not delve into its approaches here. MacKaye, "Regional Planning and Ecology." For more on the Chicago School, see Ernest Watson Burgess, Roderick Duncan McKenzie, and Robert Ezra Park, *The City* (Chicago: University of Chicago Press, 1967); Roderick D. McKenzie, "The Scope of Human Ecology," *Publications of the American Sociological Society* 20 (1926), 141–154; Emanuel Gaziano, "Ecological Metaphors as Scientific Boundary Work: Innovation and Authority in Interwar Sociology and Biology," *American Journal of Sociology* (1996), 874–907.

[34] Tensions such as these were arguably inevitable outcomes of the RPAA's collective structure: although the group's regional vision was quite coherent, different members inevitably manifested that vision in contrasting ways.

[35] This was in contrast to the work of RPAA contemporaries such as Clarke, Frederick Law Olmsted Jr., and Nolen, and those influenced by the RPAA, such as the Telesis Group. Although these other designers practiced design and planning at urban scales, they did not philosophize as extensively as some RPAA members about how such work should be done; as such, they were not as regularly or extensively read by designers working on freeways in the 1960s as RPAA members such as Mumford and MacKaye.

[36] MacKaye engaged such analyses when advocating for the Appalachian Trail, working for the Tennessee Valley Authority, and in his own theoretical projects. Wright drew a series of statewide development plans for the State of New York in the 1920s. Benton MacKaye, *The New Exploration* (Harcourt, Brace and Company, Inc., 1928); *Report of the Commission of Housing and Regional Planning to Governor Alfred E. Smith* (Albany: J.B. Lyon Co., 7 May 1926), reprinted in *Planning the Fourth Migration*, ed. Carl Sussman (Cambridge, MA: MTT Press, 1976), 145-194.

to regional development, and a lack of precedent regarding just how to *design* for that development.[37] As urban designers embraced key aspects of the RPAA vision in the 1960s, they would find themselves working with ideas that were at once rhetorically potent and practically unfulfilled.

Simultaneous to 1930s debates regarding how freeways should operate relative to cities, a more internal methodological and technical discourse was evolving within U.S. architectural and landscape architectural disciplines regarding precisely how designers envisioned living environments. During this period, the very notion of how to design was being overturned in the United States. With the wartime emigration of Bauhaus educators, students studying landscape architecture, architecture, and urban planning in various U.S. institutions encountered European avant-garde design approaches for the first time.

From the late 1930s until the end of WWII, the primary site of this development was the Harvard Graduate School of Design (GSD), where dean Joseph Hudnut hired Walter Gropius as chair of the Department of Architecture in 1937.[38] In that same year, László Moholy-Nagy founded the New Bauhaus program in Chicago, and György Kepes, who had worked for Moholy-Nagy in Berlin and London, joined him on the faculty.[39] At the end of World War II

[37] In the following decades RPAA Members would teach at universities and participate in events such as the 1958 Rockefeller Foundation Conference on Urban Design (where attendees included Lewis Mumford, Catherine Bauer Wurster, Kevin Lynch, Ian McHarg, and Jane Jacobs). Their ideas would also influence San Francisco-based design collective Telesis, whose members successfully advocated for the conservation of open space throughout the Bay Area. RPAA member Catherine Bauer-Wurster and her husband William Wurster personally supported the careers of young designers such as Lawrence Halprin, who they offered work and introduced to Thomas Church (see Chapter Two). Mumford's criticisms of cities' rampant development, pollution, and congestion would re-emerge in the 1960s work of Ian McHarg, who cited Mumford and other RPAA members as influences (see Chapter Four).

[38] For an account of Hudnut and Gropius' complex relationship, see Jill E. Pearlman, *Inventing American Modernism: Joseph Hudnut, Walter Gropius, and the Bauhaus Legacy at Harvard* (Charlottesville: University of Virginia Press, 2007).

[39] This school would eventually merge with the Illinois Institute of Technology, in 1949.

William Wurster, then dean of MIT's School of Architecture and Planning, overhauled that program as well, forming a diverse modernist-leaning faculty that included Kepes, Vernon DeMars, and Alvar Aalto.[40] The leading designers on the freeway design projects discussed in later chapters were all students at these institutions during the decades of transition; their understandings of design practice were therefore shaped by this period in which U.S. modernism took shape.

In this time of pedagogical transition, emerging approaches to landscape and urban design were often defined less by established curricula than by students' interests, pursuits, and interpretations. At the GSD, for example, landscape architecture students such as Garrett Eckbo, Dan Kiley, James Rose, and later Lawrence Halprin, uninspired by the Beaux-Arts landscape curriculum, largely drew on chosen influences to craft their own modernist educations outside of assigned coursework.[41] They associated with architecture students, and sought out instructors such as Gropius, Marcel Breuer, Christopher Tunnard, and occasional visitors Moholy-Nagy and Kepes.[42] They folded these experiences together with exposures to works by Paul Klee and

[40] Vernon DeMars had worked closely with Garrett Eckbo in California, and both were members of Telesis (see Chapter One). Marc Treib, *An Everyday Modernism: The Houses of William Wurster* (University of California Press, 1999), 90-92. See also Arindam Dutta, ed., *A Second Modernism: MIT, Architecture, and the 'Techno-Social' Moment.* (Cambridge, Massachusetts: SA+Press, Department of Architecture, MIT, 2013).

[41] Anthony Alofsin, *The Struggle for Modernism: Architecture, Landscape Architecture, and City Planning at Harvard* (WW Norton & Company, 2002), 159-162.

[42] Kepes' collaborative urban research with Kevin Lynch will be discussed at length in Chapter Three. While the modernist dimensions of Gropius' architecture program were quite established during this period, the landscape architecture program was still defined by Beaux-Arts approaches. For students of landscape architecture, developing a modernist approach was therefore defined less by curriculum than by individual interest. Landscape architecture students who embraced modernism at the GSD in the 1930s-40s would do so largely on their own time, attending architecture professors' lectures and courses, even tagging along on architecture field trips. See, for example, Transcript, "Lawrence Halprin Oral History," Interviewed by Charles A. Birnbaum and Tom Fox (The Cultural Landscape Foundation, 2008), 7-9. https://tclf.org/sites/default/files/atoms/files/Halprin-Transcript.pdf (Accessed July 21, 2017).

Frank Lloyd Wright, crafting avant-garde approaches uniquely calibrated to designing for landscapes and natural forces.[43]

Because these students were developing individualized modernist educations aside from their program's curricula, such forays are not easily summarized. That said, modernist-leaning landscape and planning students did often repeatedly mention certain individuals as influences, whose approaches were in turn apparent in their work. After Tunnard, for example, volumetric spatial relationships could be understood to evoke transcendent experiences of living sites.[44] After Klee, drawing could be engaged as a practice of communing with and channeling natural forces.[45] After Gropius, collaboration and craft could be seen as essential aspects of design practice.[46] After Moholy-Nagy and Kepes, art and science could be seen as potentially allied fields that together could inform new technological approaches to design.[47] As students cobbled

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[43] To provide a few examples: Lynch and Halprin were both influenced by Frank Lloyd Wright. Lynch studied at Taliesin; Halprin visited for a day, deciding immediately after that he wanted to pursue architecture. Both Lynch and Halprin were inspired by writings of Tunnard. Anna Halprin recalls that Lawrence Halprin took an inspirational Basic Design course based on the teachings of Klee. Lawrence Halprin, "A Landscape Architect's Appreciation of Church's Place in Environmental Design History, in *Thomas Church, Landscape Architect*, interviews conducted by Suzanne B. Riess (Regional Oral History Office, The Bancroft Library, University of California, Berkeley, 1978), 728; Anthony Raynsford, "Civic Art in an Age of Cultural Relativism: The Aesthetic Origins of Kevin Lynch's Image of the City," *Journal of Urban Design* 16.1 (2010), 43-65; Janice Ross, *Anna Halprin: Experience as Dance* (University of California Press, 2007), 52.

[44] See Christopher Tunnard, *Gardens in the Modern Landscape* (London: Architectural Press, 1938), 107-108.

[45] According to Klee: "The artist cannot do without his dialogue with nature, for he is a man, himself nature, a piece of nature and within the space of nature." Furthermore, "[The artist's] sense of direction has brought order into the passing stream of image and experience… He does nothing other than gather and pass on what comes to him from the depths. He neither serves nor rules – he transmits." Paul Klee, *The Nature of Nature*, *Volume 2* (Wittenborn Art Books, 1973), 6; Paul Klee and Paul Findlay, *On Modern Art* (Faber & Faber, 1966), 13-15. See also John David Dewsbury and Nigel Thrift, "'Genesis Eternal': After Paul Klee," in *Deleuze and Space*, eds. Ian Buchanan and Gregg Lambert (University of Toronto Press, 2005), 89-108.

[46] Ian McHarg, for example, recalls how Gropius complimented his team thesis project for its success as a collaborative endeavor. Ian L. McHarg, *A Quest for Life: An Autobiography* (John Wiley & Sons, 1996), 90.

[47] These attitudes were laid out in detail in László Moholy-Nagy, *The New Vision* (New York: Wittenborn, Schultz, 1947); György Kepes, *The New Landscape in Art and Science* (P. Theobald, 1956).

together such attitudes and influences, new U.S. modernisms in landscape architecture and urban design began to emerge.[48]

These approaches embraced broadly familiar modernist attitudes regarding volumetric definition of space, new technologies, and cultural innovation. At the same time, they integrated a variety of techniques for drawing and designing relative to natural forces that, while identifiably part of the modernist movement, were less prevalent at the time among architects. Perhaps due to the fact that they were adapting architectural strategies, these new landscape and urban approaches tended at first towards the site scale rather than the whole city or regional scale, even when designers had broader issues or dynamics in mind.[49] As such, the U.S. modernist movement's distinctive discourses and experiments regarding how to design relative to environmental and natural processes were initially developed largely on spatial terms, as matters of kinesthetic experience. The approaches that landscape and urban designers embraced in the 1930s-40s would therefore play out in new ways in the 1950s-60s, when they confronted the new scales and social, environmental, and political complexities of urban freeways.

[48] Although in this paragraph I associate various approaches with modernists who embraced them and who GSD students credited as influences, I do not suggest here that those individuals were the sole inventors of such approaches. Modernist designers who studied at the GSD during the 1930s-40s tended to downplay their Beaux-Arts training and emphasize their involvement in modernism to a notable extent; as a result, their narratives likely mask non-modernist influences on the techniques and methods that they cultivated. Parsing out the nuances of shifts between Beaux-Arts and modernist techniques and methods is beyond the scope of this dissertation, as it is a complex topic in its own right. Reyner Banham pointed to this complexity in *Theory and Design in the First Machine Age*, arguing that the supposed technological advancements of modernist architecture were more rhetorical than based in modernists' actual design practices. According to Banham, those practices remained more connected to prior movements – and those movements' concerns for aesthetics, intuition, and other qualitative determinants – than modernists typically cared to admit. Reyner Banham, *Theory and Design in the First Machine Age* (New York: Praeger, 1960), 320-333.

[49] See, for example, the discussion of Garrret Eckbo's work in Chapter One.

Postwar Years: Cybernetics, Systems Thinking, Computerization

With World War II, highway planning became intertwined with national defense, and far more quantitative and logistical in character. Only a handful of freeways were built during the war, mostly to serve wartime production.[50] When WWII was over, after analyzing U.S. successes in bombing Germany's tightly clustered industrial plants, the federal government actively promoted dispersal of industrial facilities outside of urban centers, and subsidized cities to plan metropolitan beltways that could support suburban transport.[51] The resulting urban development model was far removed from parkway-based models: concerned not with open space, quality of life, or aesthetics, but rather with the optimal configuration of production infrastructure for defensibility. The postwar federal government, expanded in research and engineering capacity, essentially re-envisioned cities as extensions of wartime production: the implementation of this vision impacted urban ideals, highway planning, and federal power at the urban level. After WWII, this defense-based approach became increasingly economic as well, as commercial deployments of wartime innovations and production infrastructure propagated a postwar boom.

The extensive governmental wartime funding of engineering and scientific research resulted not only in these new ways of planning, building, and subsidizing, but also in markedly new ways of thinking about – and eventually of modeling the operations of – complex dynamic systems. Defense-oriented cybernetics and computer research advanced together during the war.

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[50] The Detroit-area Davison Highway and Willow Run Expressway, for example, were built to serve automobile plants that had been converted for warplane production. Some other highway projects, such as the Brooklyn-Queens Expressway, were negotiated during this period but remained unconstructed. Sarah Jo Peterson, *Planning the Home Front: Building Bombers and Communities at Willow Run* (The University of Chicago Press, 2013); "The Davison Freeway from M-10 to Oakland Avenue (Davison Limited Highway) Wayne County Michigan," *Historic American Engineering Record, National Park Service No. MI-103*; Gandy, *Concrete and Clay,*" 115-137.

[51] Peter Galison, "War Against the Center," *Grey Room* 1.4 (2001), 5–33. See also Reinhold Martin, "The Organizational Complex: Cybernetics, Space, Discourse," *Assemblage* 37 (1998), 103-127.

In the postwar years, each gained momentum in numerous fields, professions, and governmental contexts. In the 1960s, cybernetics and computerization would significantly impact approaches to freeway design, and definitions of the urban environment.

The field of cybernetics emerged out of World War II weapons engineering. Conducting research for the U.S. military, MIT mathematician Norbert Wiener sought to build an anti-aircraft machine intended to improve firing accuracy by anticipating the movements of enemy airplanes. Wiener and others continued to research the use of dynamic feedback loops to direct and control multi-part electrical and communication systems after the end of the war. Studies of feedback in complex systems continued to be supported by a robust military-industrial complex, and saw enormous development in the postwar United States. Cybernetic ideas and methods were disseminated through distinctly interdisciplinary conferences and publications, becoming popular in a wide variety of fields, including biology, anthropology, and the arts.[52]

A central concern of cybernetic research involved directing and controlling complex systems. Diagrams representing such systems used boxes to depict parts of a whole, with arrows representing the movement of information or electricity between the parts. These diagrams displayed feedback: a doubling back through which the interaction of aggregated parts generated a responsive, dynamic, integrated whole. In order to maintain control over a given system, cyberneticists often sought to manage its entropy: its tendency towards disorder and uncertainty. The question of how to do this prompted extensive debate regarding the relationship between system complexity and user control. For many cyberneticists, this tension between complexity and control was understood, not as a mere matter of engineering, but rather, owing to the field's

[52] Peter Galison, "The Ontology of the Enemy: Norbert Wiener and the Cybernetic Vision," *Critical Inquiry* 21.1 (1994), 254–255.

early interdisciplinarity, as a broad matter of relationships between humans, machines, and the natural world.

Cybernetics' interdisciplinary breadth ensured a rapid migration of its concepts and approaches throughout a number of fields. With regards to urban and landscape design, this influence arrived through two different migrations: one via scientific ecology, the other via the arts. As it circulated through ecology, cybernetic thinking resulted in depictions of ecosystems as precise, contained, and directable entities, defined with circuit metaphors, well-defined frames, and closed cycles.[53] In contrast, the adoption of cybernetics in the arts brought about markedly open and indeterminate models of systems. Rather than seeking to control entropy, artists instead identified uncertainty as productive "chance": an inspiration for newly participatory and open-ended compositions. In this way, they found in cybernetic ideas inspiration for relinquishing, rather than increasing, control over creative process and the resulting compositions.[54]

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[53] From the postwar years through the 1960s, cybernetics became highly influential in scientific ecology. One of the early members of the influential Macy Cybernetic Conferences was ecologist G. Evelyn Hutchinson. The ecological models of his student Howard (H. T.) Odum drew extensively from cybernetic theories: they referenced relationships between entropy and order, often directly borrowing from cybernetic diagrams of electrical circuits in order to describe ecosystem dynamics. Peter Taylor has identified Odum's philosophy as a sort of "technocratic optimism," noting: "the new theorists of feedback systems conceived of nature as a machine and, at the same time, acknowledged the purposive and regulatory character of that nature-machine." H.T. Odum and his brother Eugene were influential figures in the field of ecology: they were well funded, receiving economic support from the Atomic Energy Commission and a newly emergent National Science Foundation, and produced what became the primary ecology textbook for more than a decade. Peter J. Taylor, "Technocratic Optimism, H. T. Odum and the Partial Transformation of Ecological Metaphor after World War II," *Journal of the History of Biology* 21 (1988), 221; J. B. Hagen, *An Entangled Bank: The Origins of Ecosystem Ecology* (New Brunswick: Rutgers University Press, 1992), 109-112.

[54] Composer John Cage and choreographer Merce Cunningham collaboratively used "chance operations" to integrate uncertainty into the composition process. Cage began investigating circuit-based electronic music in the 1950s, recommending Wiener's books to his students. In the 1950s, Cage and other members of a composers' group called The New York School invented the open score, which embraced chance by suggesting general intentions and potential interpretations rather than decisively directing the performer, resulting in flexible and unpredictable performances. Throughout the 1960s, open scoring would become increasingly popular, particularly through Cage's influence. Fluxus, Judson Dance Theater, and the Halprins would all work extensively with scores. David Nicholls, "Getting Rid of the Glue: The Music of

As these two different approaches to systematic uncertainty and control found their way into urban and landscape design, they resulted in different characterizations of the roles of designers within dynamic living systems. To what degree should designers envision urban environments as bound, definable entities, as opposed to open, indeterminate ones? And what were their optimal roles relative to such complex systems: were they objective managers of, or situated participants in, the complex systems that they sought to understand and alter?[55] Questions such as these would frequently underlie freeway debates in the years to come.[56]

Advances in computerization would move more slowly than the dissemination of cybernetic ideas, particularly with regards to computerized mapping and visualizing; in the meantime, cybernetic discourse brought an anticipation of technological advancement that influenced how designers engaged data and visualized sites.[57] In the 1950s, highway engineers, for example, proposed computer-based methods that were not yet possible, in expectation that computing power would be rapidly increasing. By the early 1960s, some landscape architects and planners would similarly imagine future computer uses, such as ways that computers could be used for analyzing land use patterns and potentials; however, computers would still not be capable of processing data in two-dimensional spatial fields for several years.[58] The outcome of

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the New York School," *Journal of American Studies* 27/3 (1993), 335–353; Christina Dunbar-Hester, "Listening to Cybernetics: Music, Machines, and Nervous Systems, 1950–1980," *Science Technology and Human Values* 35/1 (2010), 128; Sally Banes, *Democracy's Body: Judson Dance Theater, 1962–1964* (Ann Arbor, MI: UMI Research Press, 1983), 1–33.

[55] I explore this question and review the history of cybernetics' influence on landscape architectural design at greater length in: "McHarg's Entropy, Halprin's Chance: Representations of Cybernetic Change in 1960s Landscape Architecture," *Studies in the History of Gardens & Designed Landscapes* 34.1 (2014), 71-84.

[56] This tension between uncertainty and control permeates all of the following chapters, often emerging in relation to the openness of drawing processes, and notions of the immeasurability of living wholes.

[57] On the anticipatory and often 'pseudo-scientific' character of computer-inspired design during this period, see Keller, "Fenland Tech," 59-60.

[58] Scholars would not significantly begin exploring computer-based geographic visualization until the early 1960s, and it would be several years more before even basic two-dimensional maps would be

these anticipatory experiments would be a series of practices that were analog in execution, but essentially computational in character: such as increased uses of data as information regarding natural and urban conditions, and incorporation of computational logics into design techniques and methods. As they developed through the 1960s, such approaches would be increasingly promoted as improvements on qualitative precedents, in that they were purportedly more rational and objective.[59]

In the 1960s, cybernetics and computer engineering – one conceptual, the other technical – would both be used to support increasingly operative approaches to solving problems in a wide range of disciplines. On one hand, they would be used as means for projecting and exercising expertise and authority in many fields: often through embracing a "systems approach," which foregrounded quantitative and statistical methods in new ways.[60] On the other hand, cybernetic thinking would introduce, through its arts-based variants, notions of openness and indeterminacy that reinforced Bauhaus-based and Gestalt-influenced notions of natural systems as transcendent wholes of which the designer was not a distant manager, but rather an intrinsic part.

From the 1950s to the 1960s: Towards the Environments of Urban Freeways

Parkway precedents, urban futurism, regional environmentalism, postwar government apparatuses, urban decentralization, modernist design techniques and methods, cybernetics, advances in computerization: by the 1960s, all these would intersect around the subject of urban freeways. It would, however, take some time for this complex entanglement to manifest in

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produced via computer programs. J. Terry Coppock and David W. Rhind, "The History of GIS," *Geographical Information Systems: Principles and Applications* 1.1 (1991), 21–43.

[59] Economic analysis played a significant role in this quantification as well. See Chapter Four for more on engineers' uses of cost-based land analyses and designers' adoptions of – and resistances to – such approaches; and also for more on the increasing influence of computers on design approaches in the mid-late 1960s.

[60] For a more extensive discussion of the "systems approach," see Chapter Five.

freeway debates. Through the 1950s, associations of open space with roadway design nearly vanished, as government agencies – viewing urban regional development as a matter of defense, and highway infrastructures as utilitarian tools – almost exclusively hired engineers to site and construct freeway structures.[61] Designers' and planners' roles in highway and freeway planning diminished during this period, as did considerations of how freeways might impact everyday urban life.[62] Highway landscapes were increasingly framed in this context as matters of "roadside beautification": uses of vegetation to screen and visually enhance highway edges.[63] With these shifts, the urban parkway model was jettisoned, and the freeway model embraced: urban highways were to be engineered, streamlined concrete structures, autonomous relative to their urban surroundings, and calibrated to efficiently convey traffic between city centers and their suburban surrounds.

By the mid-1950s, this engineering-based approach remained largely untested within city limits, where few freeways had yet been built.[64] This shifted, however, with President

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[61] This shift started in the 1920s with the growth of the field of traffic engineering, but it took even greater hold as highway construction boomed in the postwar years. For more on disciplinary competition between highway engineers and designers and planners, see Jeffrey R. Brown, Eric A. Morris, and Brian D. Taylor, "Planning for Cars in Cities: Planners, Engineers, and Freeways in the Twentieth Century," *Journal of the American Planning Association* 75.2 (2009), 161–177; Louis Ward Kemp, "Aesthetes and Engineers: The Occupational Ideology of Highway Design," *Technology and Culture* 27 (1986), 759–797.

[62] Despite a lack of work for designers and planners in highway projects, designers continued to have disciplinary discussions regarding how they might influence highway design. In these discussions, they often voiced concerns regarding highway engineers' failures to consider the impacts of freeways on cities. See, for example, "Landscape Design in Highway Development," *Landscape Architecture Magazine* (1941), 71-73; Grady Clay et.al., "New Highways: Number One Enemy? Ten Specialists View (With Some Alarm) the Highway System," *Landscape Architecture Magazine* 49.2 (1958), 79-98.

[63] While this "edge" approach to highway landscapes dated back to the roadside beautification movement of the 1910s, it became the predominant approach to highway landscapes with postwar wane of parkway models and ascendance of engineering approaches. For a representative example of this approach, see *The Art and Science of Roadside Development: A Summary of Current Knowledge* (Washington, DC: U.S. National Research Council, 1966).

[64] In the absence of significant funds for implementation, urban freeway planning and construction was a piecemeal and largely local affair until the Highway Act standardized funding mechanisms nation-wide. Rose and Mohl, *Interstate*, 55-68.

Eisenhower's Federal Aid Highway Act of 1956.[65] Otherwise known as the National Interstate and Defense Highways Act, it both accelerated highway building throughout the country and focused construction on urban freeways. The largest public works project to that date, the act provided $25 billion in funds for highways, with planning and construction to be managed by state level highway divisions that were largely run and staffed by engineers. This was a powerful engine for implementation. It gave state governments funds for urban freeways, and the authority to plan and build them at local levels.[66] It also promoted an association between freeway construction and urban redevelopment that would continue through the following decades.

As the 1956 act accelerated engineering-based urban freeway siting and construction though the late 1950s, the resulting controversies brought issues of lived urban space roaring back into highway discussion and design. Urban dwellers quickly discovered that while freeways appeared as lithe lines on maps, they were something else entirely on the ground. As initial urban freeway stretches were constructed, residents watched them displace large numbers of residents, erode neighborhood structure, disrupt local connectivity, and compromise parks and other civic resources. By the early 1960s, local resistance to state plans was rapidly forming in cities throughout the US: a "freeway revolt" movement was taking shape.[67]

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[65] There were numerous smaller highway-related acts preceding this one, and many others that followed. I do not generally mention such acts here except when they directly impacted the 1960s freeway debates and designs discussed in the following chapters. For a detailed list of significant governmental legislation regarding freeways throughout the twentieth century, see DiMento and Ellis, *Changing* Lanes, 133-142.

[66] In some cities, such as San Francisco, city planners had already commissioned freeway plans, so state implementation was based on those plans (see Chapter One). In other cities, such as in Boston, earlier urban freeway plans had been commissioned by the state (see Chapter Two). Regardless of who had drawn the original plans, implementation was placed in the hands of state governments; as a result, freeway protests tended to be battles between urban residents and state governments, and protestors tended to blame state agencies for urban plans, regardless of initial origin.

[67] See, for example, "The Revolt Against Big-City Freeways," U.S. *News and World Report*, January 1, 1962, 48-51. For an overview of the freeway revolts, see Raymond A. Mohl, "The Interstates and the Cities: The U.S. Department of Transportation and the Freeway Revolt, 1966–1973," *Journal of Policy*

A popular environmental movement grew in these years as well. As freeway resistance and environmental activism intersected, each movement defined the other in impactful ways, especially regarding conceptions of cities as dynamic living entities. Rachel Carson's 1962 *Silent Spring* was a key influence on the growth of the environmental movement; it had an urban counterpart of sorts in Jane Jacobs' 1961 *The Death and Life of Great American Cities*.[68] In the years to follow, U.S. environmentalism and urbanism folded together through debate and discourse around freeways and related urban renewal. As freeways' massive scales and governmental implementations caused social, environmental, and political confrontations over the city's infrastructures and lived spaces, emergent freeway environmentalism catalyzed a distinctly hybrid, inter-scalar conception of the urban milieu.

Numerous U.S. landscape architects, architects, and planners contributed to this emerging urban environmentalism in these years, especially as they embraced roles as urban designers. Responding to government-driven urban redevelopment, many designers began exploring new strategies for analyzing and designing the dynamic, experiential, and lived dimensions of urban structure and organization. The Rockefeller Foundation's Urban Design Studies initiative supported several forays into urban design at this time. From 1955 to 1965 they funded explorative research projects by Jane Jacobs, Kevin Lynch and György Kepes, Christopher

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History 20.2 (2008), 193–226. The built (and unbuilt) outcomes of freeway revolts varied city by city; accounts of individual cities include Ari Kelman, *A River and its City: The Nature of Landscape in New Orleans* (Univ of California Press, 2003), 197-222; Sidney Wong, "Architects and Planners in the Middle of a Road War: The Urban Design Concept Team in Baltimore, 1966–71," *Journal of Planning History* 12.2 (2013), 179–202. See also accounts of San Francisco and Boston freeway revolts in Chapters One and Two.

[68] Regarding Jacobs' development of this book and her related early involvement with the Rockefeller Foundation, see Peter L. Laurence, "The Death and Life of Urban Design: Jane Jacobs, The Rockefeller Foundation and the New Research in Urbanism, 1955–1965," *Journal of Urban Design* 11:2 (2006), 145-172. Regarding Jacobs' famed battles against Robert Moses over urban redevelopment and freeway plans in New York City, see Anthony Flint, *Wrestling with Moses: How Jane Jacobs Took on New York's Master Builder and Transformed the American City* (Random House Trade Paperbacks, 2011).

Tunnard and Boris Pushkarev, Ian McHarg, Edmund Bacon, Christopher Alexander, and others. They also funded a 1958 Conference on Urban Design Criticism, whose attendees included Jacobs, McHarg, Lynch, Mumford, J.B. Jackson, Louis Kahn, and other significant figures in planning and design.[69] Rockefeller Foundation funding was influential in establishing and defining the nascent discipline of urban design, and several of the funded projects led to the publication of now seminal works: most notably, Jacobs' *The Death and Life of Great American Cities*, and Lynch's *The Image of the City*.[70]

The Rockefeller Foundation project illustrates two late 1950s - early 1960s trends that would interrelate in the freeway designs soon to follow. First, as designers increasingly engaged issues of urban design, some of them adopted and promoted the term "environment" as a way to identify how the dynamic qualities of cities interrelated and cohered into complex living wholes. This term was not new to designers – Benton MacKaye and Aldo Leopold had both used it in the 1920s, in ways that directly impacted discourses in design and planning. In the 1950s, the Telesis group actively promoted the notion of the urban environment in relation to regional planning, and in 1959, in extension of Telesis' conception, a new College of Environmental Design was

[69] For brief descriptions of the conference, see Laurence, "The Death and Life of Urban Design"; Ian McHarg, *A Quest for Life: An Autobiography* (John Wiley & Sons, 1996), 133. Detailed records of this conference are contained in Record Group 1.1, Series 200, Box 457, Folders 3904-3905 of the Rockefeller Foundation Collection at the Rockefeller Archive Center.

[70] Christopher Tunnard and Boris Pushkarev's *Man-Made America: Chaos or Control?* was also funded by this initiative. Some of the works emerging out of this period of funding represent what Anthony Raynsford has identified as a revival of earlier experiential "street picture" approaches to urban design and form. The fact that both freeways and environmental approaches to cities were recurring themes in many of these works illustrates the transitional nature of this work, in that it demonstrates that these projects were mixing a broad range of topics, issues, and approaches together during this time. Christopher Tunnard and Boris Pushkarev, *Man-Made America: Chaos or Control? An Inquiry into Selected Problems of Design in the Urbanized Landscape* (New Haven: Yale University Press, 1963). Anthony Raynsford, "Spectacle of the Hyper-Real: Environmental Simulation, Cybernetic Subjects, and Urban Design," eds. Mark Goulthorpe and Amy Murphy, *100th ACSA Annual Meeting Proceedings, Digital Aptitudes* (2012), 654–660.

established at the University of California Berkeley. In those contexts, the term was used to define design as an interdisciplinary project encompassing all aspects of the city.[71]

Soon, however, designers evolved this notion of environment towards a more fundamentally ecological approach to cities, in the sense that urban areas were conceived as dynamic living entities. These new notions of cities as environments extended beyond earlier human-centered models, towards conceptions that interrelated the human life in the city with other living beings, and also with topography, weather, materials, and myriad other natural forces.[72] In this way, 1960s designers began to use term "environment" as a means to integrate ideas of human ecology with living dynamics that were traditionally wilderness-based: calling out the rights of trees, expressing concern for the protection of birds, and reinforcing understandings of humans as biological beings in their own right, with their own habitats.[73]

Alongside the evolution of the term "environment," other words also circulated and shifted through freeway-related public discussions and theoretical discourse, such as "aesthetics," "beauty," "system," "relationship," and eventually "ecology." In a sense, "environment" served as a crossover term for designers during this period, as they shifted away from defining the city in terms of aesthetics and beauty, and towards dynamics that would eventually be discussed as matters of "urban ecology." Throughout the 1960s, however, all of these terms remained messy and partially formed, undergoing iterative definition and redefinition in the midst of different

[71] For more on all of these earlier uses, see Chapter Two.
[72] This discourse predates the environmental justice movement; as such it locates urban environmentalism – and specifically the mixing of civil rights and environmentalism in the inner city – somewhat earlier than is usually identified: some sources do place the movement's origins in the late 1960s, but usually in association with pollution rather than with freeway revolts. Luke W. Cole and Sheila R. Foster, *From the Ground up: Environmental Racism and the Rise of the Environmental Justice Movement* (NYU Press, 2001), 19-33. Chapters Two and Three both detail instances of such environmental justice arguments.
[73] Both Kevin Lynch and Ian McHarg associated the term "environment" with understandings of humans as fundamentally biological beings; McHarg associated the term more directly with the ecological functioning of nonhuman species and relatively undeveloped sites. See Chapters Three and Four.

arguments and advocacies. The term "environment," itself multiplicitous in meaning, remained predominant in discourse during this decade, especially as it began to define the "environmental movement" of the late 1960s and 1970s. In their evolution, these terms together were used to identify and activate emerging conceptions of cities as dynamic, interactive, living wholes.

The second trend illustrated by the Rockefeller Foundation initiative was that several of the projects they funded – especially the work of Lynch and Kepes, Tunnard and Pushkarev, and McHarg – either directly or indirectly investigated the design of highways and freeways. Interest in designing freeways expanded beyond this small cluster of designers in the following years, as designers, like local protesters, became increasingly concerned that freeways posed threats to existing urban fabrics.[74] As designers' interests in freeways grew, they initially remained largely shut out of freeway siting and design on the ground. When freeway revolts multiplied throughout the 1960s, however, the controversies frequently brought unique and varied roles for designers, who often saw the protests as evidence that more thoughtful approaches to freeway design were needed, and as opportunities to get involved in the process of re-envisioning whole cities.[75]

Designer involvement took different forms in different cases, including developing conceptual approaches for publication, assisting state governments to present modified plans to local protestors, crafting highway location analyses for public use by protesters who opposed freeway proposals, and participating in protests directly.[76] Whatever the form of involvement,

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[74] Grady Clay, editor of *Landscape Architecture Magazine* from 1960-1984, was particularly outspoken about the problems of highway and freeway planning during the 1950s-60s. Clay, "New Highways."
[75] A 1963 special issue of *Architectural Forum* on the subject of freeways would review several freeway design proposals, including several of the works discussed in the following chapters. *Architectural Forum* 10 (1963).
[76] To cite a Canadian example of such involvement, several landscape architects and planners were leaders in successful 1960s protests against Vancouver freeways. Peter Oberlander, founder of the university's School of Community and Regional Planning, resigned from his position on Vancouver's Town Planning Commission in protest of the freeway plan. Tyler Stiem, "Story of Cities #38: Vancouver

these semi-official roles as consulting professionals frequently led to some degree of mediation between locals and government officials.[77] And yet designers were not trained in public facilitation, nor were they generally inclined towards supporting public resistance to urban projects. They were, rather, in the business of imagining new built futures. Not surprisingly, they tended to do this according to their expertise. Experimentally *envisioning* freeways on newly environmental terms, designers explored how they could be analyzed, imagined, and designed as complex living wholes, at once systematic and lived.[78]

Freeway projects propagated experimentation – indeed, reckoning – with the very techniques and methods that formed the basis of 1960s designers' education and training. As the decade proceeded, technological innovation influenced such reckoning in significant ways. These influences were more pronounced at urban, regional, and larger scales, where the experiential foci of pre-existing modernist design approaches proved insufficient. At larger scales, designers began increasing their uses of data, statistics, and quantification, and also began seeking ways to do so through uses of computers. With such shifts, they began transitioning from conceiving environments in terms of immediate sensed space, towards understanding them as

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Dumps its Freeway Plan for a More Beautiful Future," *The Guardian,* May 9, 2016. https://www.theguardian.com/cities/2016/may/09/story-cities-38-vancouver-canada-freeway-protest-liveable-city. Accessed July 24, 2017.

[77] For an example of architects and planners playing a particularly active role in local negotiations, see Wong, "Architects and Planners in the Middle of a Road War."

[78] Some architects, for example, re-envisioned freeways as built forms. Paul Rudolph, Louis Kahn, Venturi Scott-Brown, and The Architects' Collaborative all worked on freeway projects between the 1950s-1960s. Although these proposals are interesting in their own right, I do not explore them here, for their studies tend more towards structural approaches than towards environmental ones. Paul Goldberger, "Paul Rudolph's Manhattan Megastructure," *The New Yorker*, November 8, 2010; Louis Kahn, "Toward a Plan for Midtown Philadelphia," *Perspecta* 2 (1953), 10-27; Sebastian Haumann, "Vernacular Architecture as Self-Determination: Venturi, Scott Brown and the Controversy over Philadelphia's Crosstown Expressway, 1967-1973," *Agency in Architecture: Reframing Criticality in Theory and Practice* 3.1 (2009), 35-48. Box 73, Folder 3, "Inner Belt - Air Rights Housing, 1965-1968"; Box 108, Folder 3(O), "Inner Belt - Cambridge Inner Belt - The Architects Collaborative, 1965"; MIT Planning Office, AC205 - Series III Library Files, MIT Institute Archives.

matters of larger-scale trajectories: still fundamentally interrelational, but more abstractly energetic than immediately felt and seen.[79]

Shifts in governmental strategies for engaging the growing environmental movement also influenced designers' changing techniques and methods: motivating designers to project expertise and objectivity so that they could better influence government actions. At state and federal levels, a succession of conferences and acts brought about greater federal involvement in local planning, resulting in the application of an increasingly legislative framework to environmental dynamics and issues. Several conferences on freeway design in urban settings brought highway engineers together with planners, architects, and landscape architects to discuss how freeways should be integrated into cities. Sponsored by the American Association of State Highway Officials and by state and federal highway divisions, these events – the Sagamore conference in 1958, the Hershey conference in 1962, the Williamsburg conference in 1966, and also a series of freeway-related discussions at the 1965 White House Conference on Natural Beauty – all served to initiate and expand dialogue at the national level with regards to how governments could best engage local issues and controversies.[80] In terms of legislation, the 1962 Federal-Aid Highway Act, for example, made a "continuing, comprehensive transportation planning process" a prerequisite for local freeway and highway project approval beginning in

[79] In discussing the influence of cybernetic thinking on designers such as Kepes, Reinhold Martin has described the broad transitions occurring in experimental design during this era as follows: "Inscribed into these… speculations is a fundamentally altered notion of embodiment, grounded now in patterned integrity rather than in spatial extension." Reinhold Martin, "The Organizational Complex," 113.

[80] *The Sagamore Conference on Highways and Urban Development: Guidelines for Action* (Syracuse, N.Y.: Syracuse University, 1958); *Freeways in the Urban Setting: The Hershey Conference* (Washington: Automotive Safety Foundation, 1962); *Highways and Urban Development: Report on the Second National Conference, Williamsburg, Va.* (American Association of State Highway Officials, National Association of Counties, National League of Cities, 1966); *Beauty For America: Proceedings of the White House Conference on Natural Beauty, Washington, DC. May 24-25, 1965* (Washington: Government Printing Office, 1965).

1965; a trio of acts in 1966 further specified protections for urban parks and historic districts.[81] As the 1960s progressed, this extensive legislative involvement in discussions of freeway environments evolved into a powerful impetus for designers to embrace quantitative and "comprehensive" approaches to design: approaches that proved more actionable within bureaucratic contexts.

Conclusion

Urban freeways and urban environments were often understood as oppositional during the 1960s, with freeways posing direct threats to urban environments. These entities were, nonetheless, defined together. Through freeway controversies, the urban environment was defined as a complex whole composed of a set of shifting material, biological, economic, and social relationships essential to human life. This entity was not only discussed, but also experimentally visualized: made increasingly imageable, manipulable, and actionable on disciplinary, public, and governmental levels. The resulting imagery in many ways reinforced the co-definition of freeways and environments, it that it presented them less in conflict than in concert: as interrelated components of the same larger living milieu.

As designers confronted the multifaceted challenges of urban freeways, they forged new terminologies, design techniques and methods, and new roles for themselves relative to sites, cities, communities, and governments. During this period of redefinition, modes of description – rhetorical and visual – sometimes evolved in coherent reinforcement; other times they evolved in

[81] According to Thomas Morehouse, though this act was signed into law in 1962, in the years between this act and its official implementation, the federal government avoided applying this principle in any substantive way. Thomas A. Morehouse, "The 1962 Highway Act: A Study in Artful Interpretation," *Journal of the American Institute of Planners* 35.3 (1969), 160-168.

direct contradiction, resulting in internally conflicted, multiplicitous manifestations. For a brief time, this experimentation enacted a markedly integrated notion of human/nature relationship: one that operated simultaneously at experiential and quantitative levels, and situated the designer within the natural system – the environment – that they sought to design, such that their practices modeled responsive interconnection within a larger natural system. As the decade proceeded, however, influenced by advances in computerization, cybernetic ideas, and government moves towards environmental legislation, designers also increasingly defined the ecological city in technology's image. Approaches to freeway environments shifted from loose experimentation towards more streamlined, standardized and codified – and therefore more governmentally effective – forms. As this occurred, early mixes of qualitative and quantitative methods were frequently jettisoned: not in favor of thoroughly rational strategies, but rather towards approaches that outwardly engaged standardization, yet internally still embraced a wide range of references, practices, connotations, and performances.

As will be detailed in the following chapters, numerous issues and innovations played out together during this period: new systems thinking, new conceptions of environment, new techniques and methods, new positions for designers, a new governmentality and politicization of the urban landscape. These would circulate through many hands, tools, practices, and debates, to bring about an understanding of the urban environment that made environmentalism newly actionable in cities and urban regions, and yet also left it rife with internal contradictions. Out of this foundation, many freeways would be cancelled entirely. In the meantime, however, new conceptions of urban nature – hybridly conflicted, holistic, systematic, and alive – would take hold and grow.

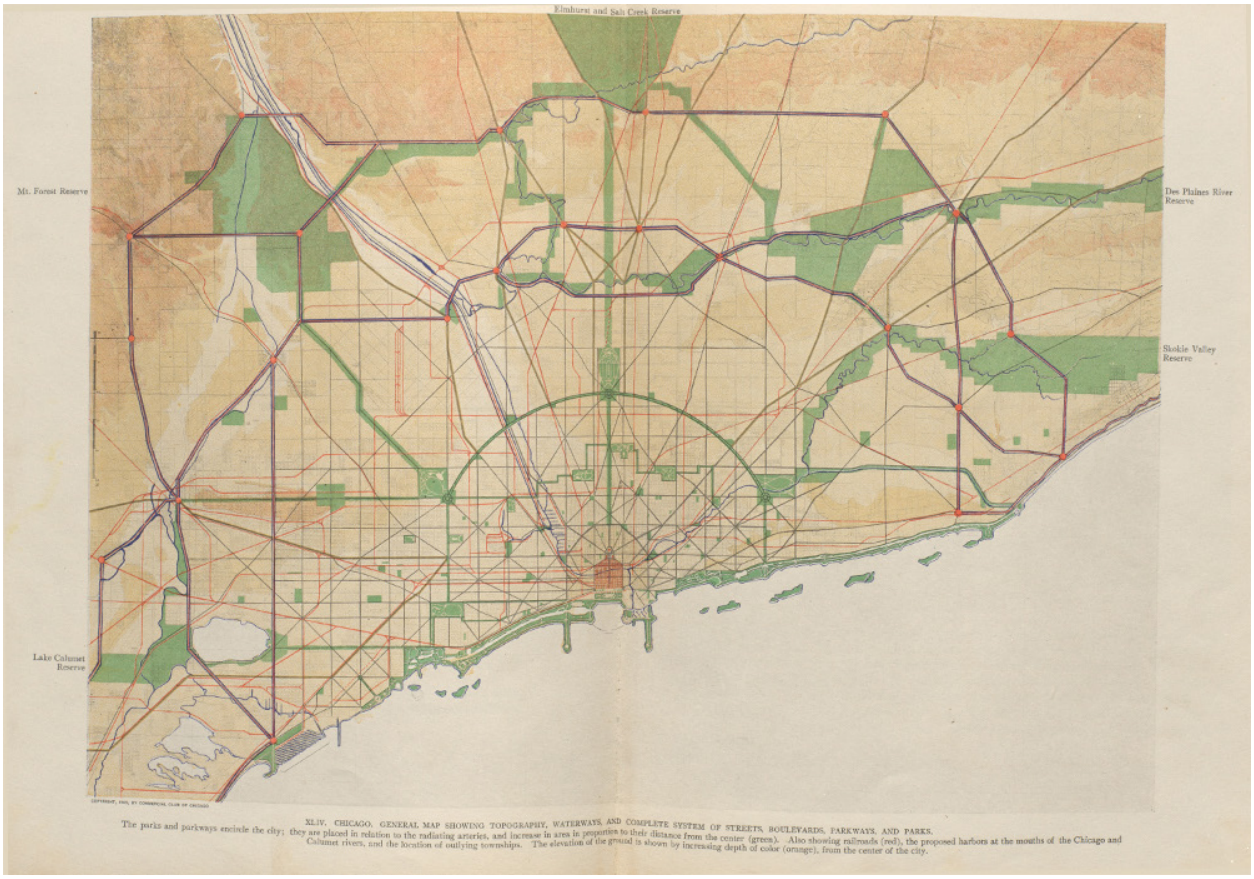

Figure 1.1. One of several plan renderings of Burnham and Bennett's Plan for Chicago: "General Map Showing Topography, Waterways, and Complete System of Streets, Boulevards, Parkways, and Parks." Daniel Hudson Burnham and Edward Herbert Bennett, *Plan of Chicago: Prepared Under the Direction of the Commercial Club During the Years MCMVI, MCMVII, and MCMVIII* (The Commercial Club, 1909).

Figure 1.2. 1925 Photograph of the Bronx River Parkway at Tuckahoe Road. Park Commission Photograph Collection, Westchester County Archives. http://collections.westchestergov.com/cdm/singleitem/collection/ppc/id/1400/rec/2 (Accessed November 26, 2017).

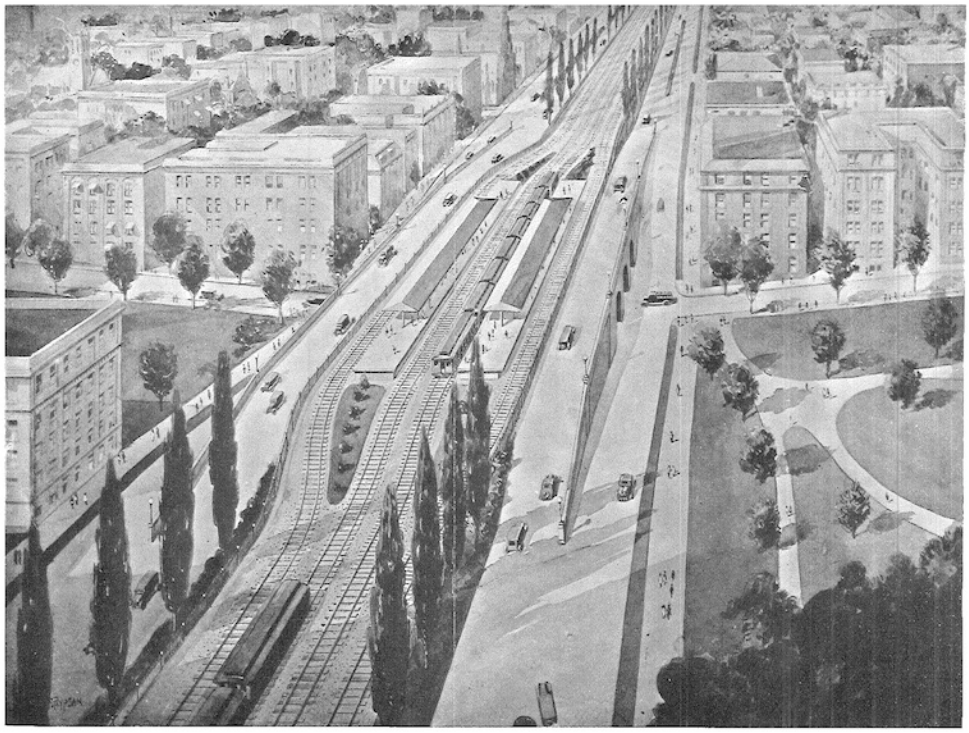

Figure 1.3. Aerial view of the 1924 Detroit "super-highway" plan. This plan combined automobile and rail traffic, with sparse vegetation separating buildings, highway, and rail. *Proposed Super-Highway Plan for Greater Detroit* (Detroit MI: Rapid Transit Commission, 1924).

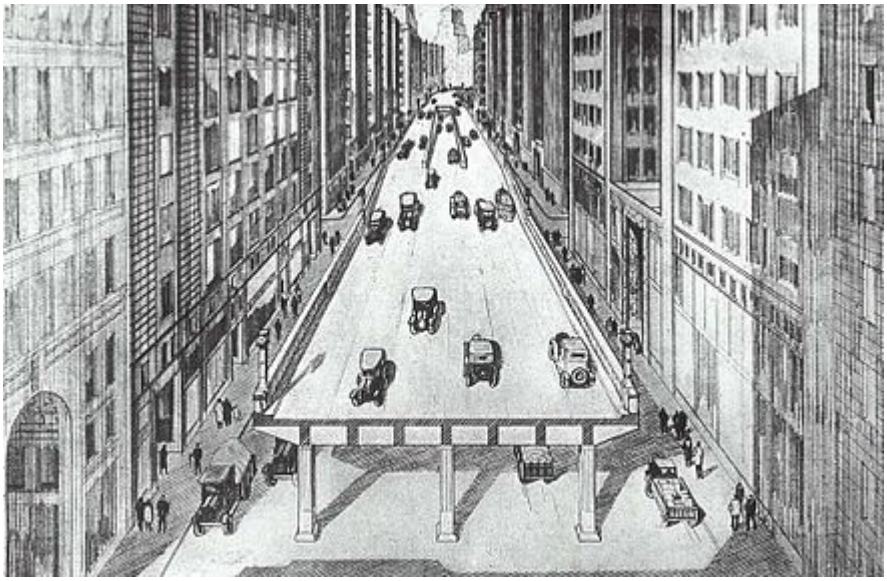

Figure 1.4. Aerial view of a 1930 proposal for Boston's Central Artery. This plan envisioned an even denser configuration than the Detroit plan, with highways raised directly above local streets like elevated railways. Robert Harvey Whitten, *Report on a Thoroughfare Plan for Boston* (Boston City Planning Board, 1930).

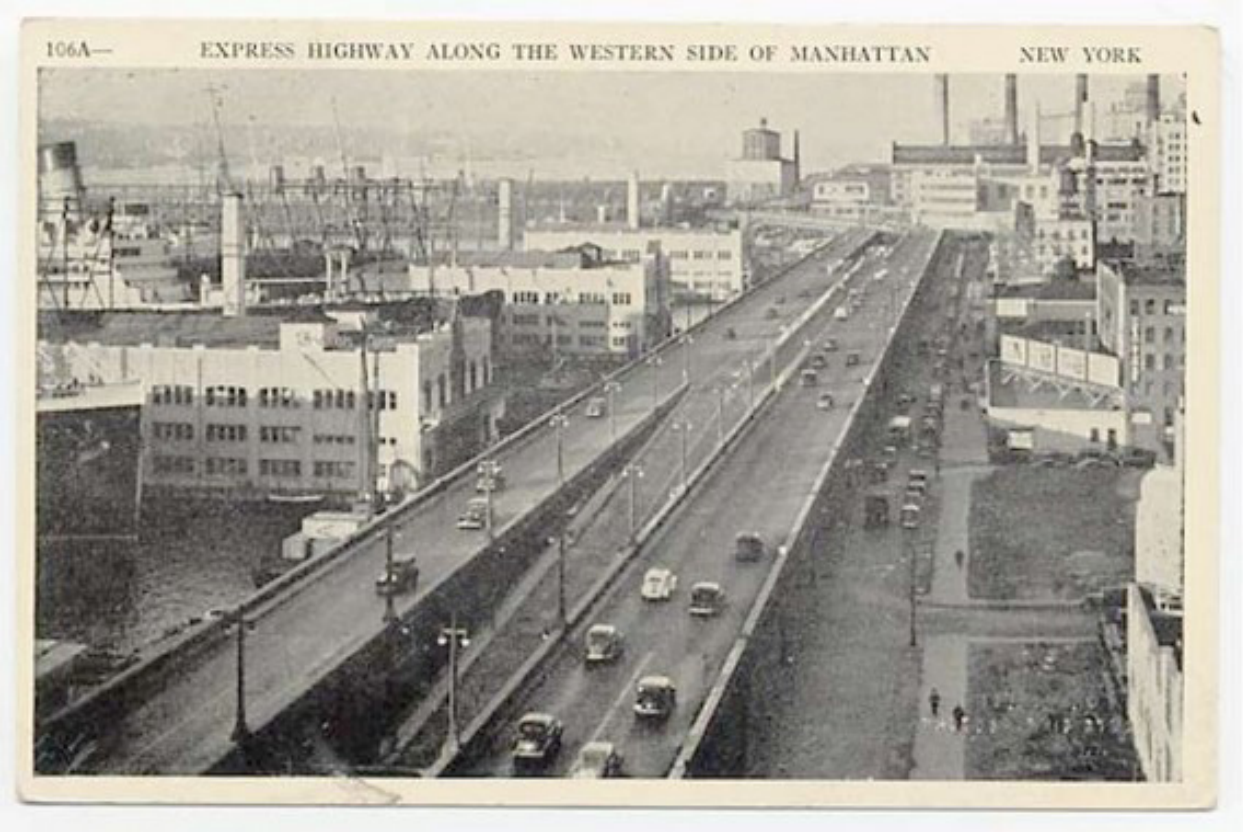

Figure 1.5. Postcard of the West Side Highway, opened in 1936. "Miller's Crossing: The West Side Elevated Highway," *Forgotten New York*. http://forgotten-ny.com/2001/06/millers-crossing-the-west-side-elevated-highway/ (Accessed July 28, 2017).

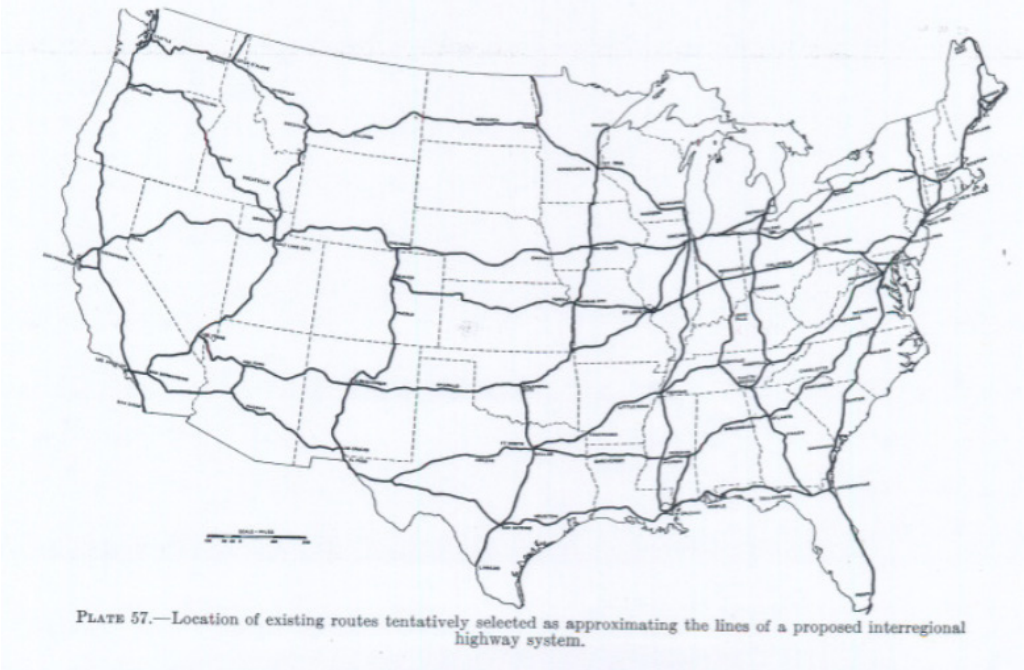

PLATE 57.—Location of existing routes tentatively selected as approximating the lines of a proposed interregional highway system.

Figure 1.6. Map of proposed interregional highway system. *Toll Roads and Free Roads: Message from the President of the United States Transmitting a Letter from the Secretary of Agriculture, Concurred in by the Secretary of War, Enclosing a Report of the Bureau of Public Roads, United States Department of Agriculture* (Washington: U.S. Govt. Print. Off., 1939), 19.

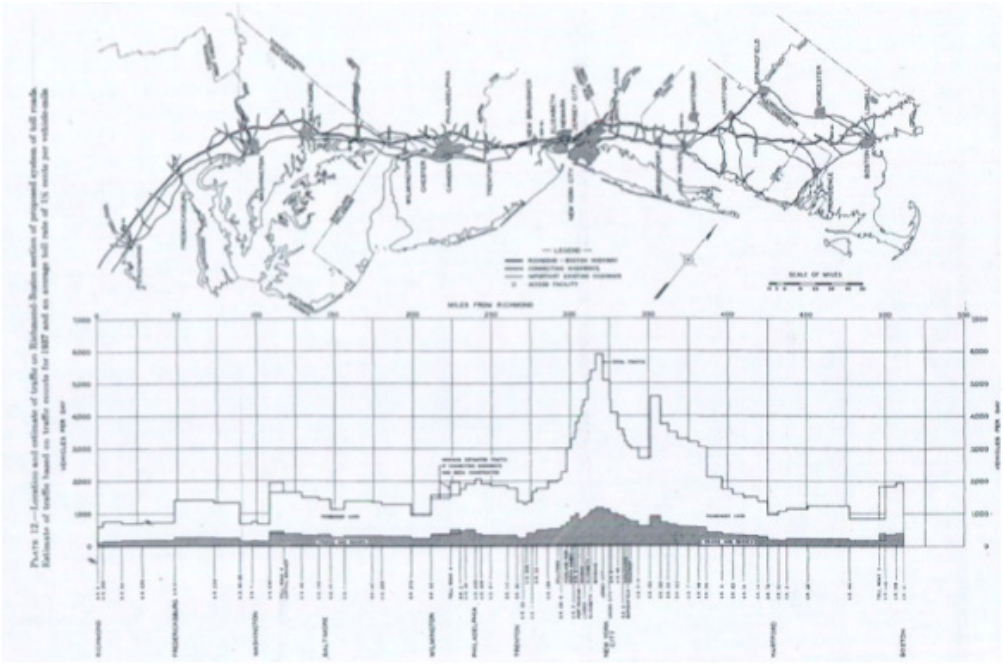

Figure 1.7. Analysis of anticipated traffic flows for a portion of highway. *Toll Roads and Free Roads*, 22.

PLATE 30.—A four-lane toll highway in a suburban and urban area, showing relation to existing streets.

Figure 1.8. Aerial view rendering of an imagined interstate highway in urban/suburban conditions. *Toll Roads and Free Roads*, plate 30.

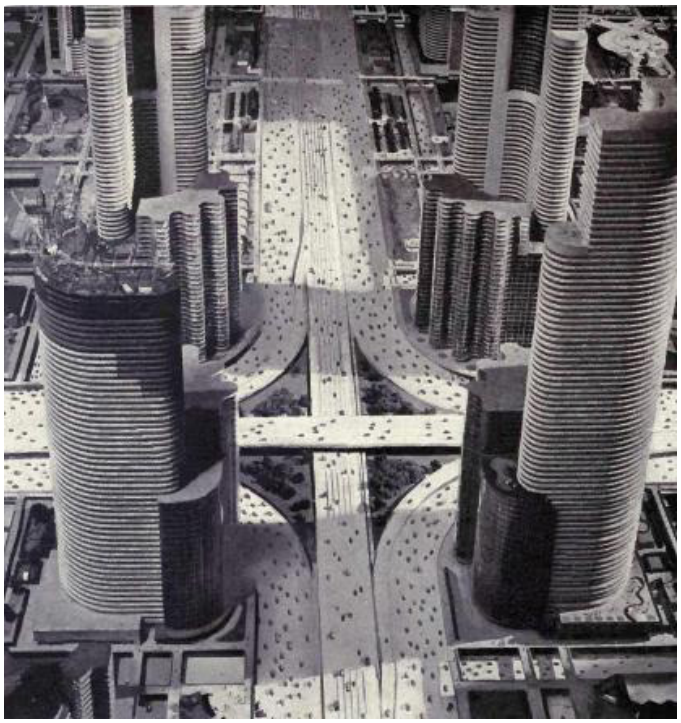

Figure 1.9. Photograph of Futurama model, showing an imagined urban scene. Donald Albrecht, ed., *Norman Bel Geddes Designs America* (Abrams, 2012).

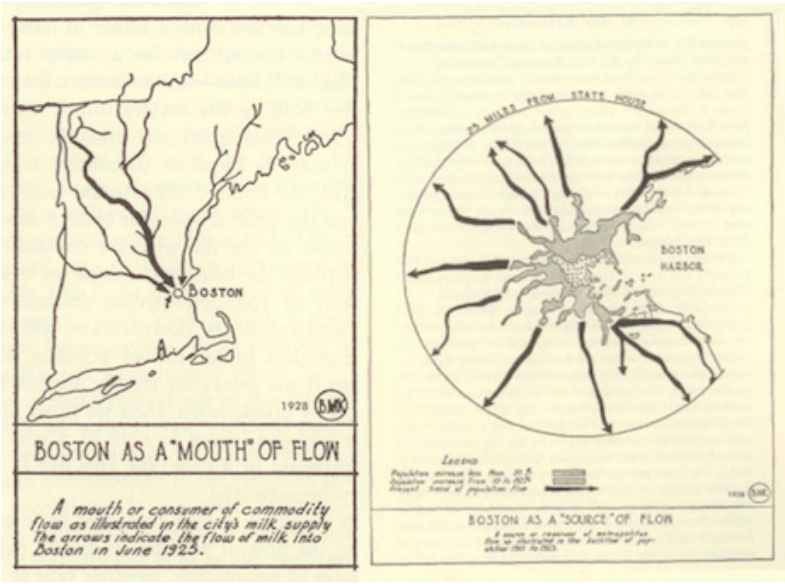

Figure 1.10. Benton MacKaye, regional maps of "Boston as a 'Mouth' of Flow" and "Boston as a 'Source' of Flow." Benton MacKaye, *The New Exploration: A Philosophy of Regional Planning* (Harcourt, Brace and Company, Inc., 1928), 172-173.

CHAPTER TWO

'A GREAT FUNCTIONING WHOLE': EMERGENT ENVIRONMENTALISM IN SAN FRANCISCO'S PANHANDLE FREEWAY DEBATES

> It is the *total quality of city life* which is at stake. What we are after is an environment whose totality is a result of the functioning of all its parts, a Gestalt, if you will, of buildings and people and open space into a great functioning whole – a great theater for events to happen and for the most evocative and creative involvements to occur. In the evolution of this environment, transportation must take its place as a form giving rather than a destructive element.
>
> - Lawrence Halprin, *Freeways*, 1966[1]

In 1962, three years after the San Francisco Board of Supervisors officially initiated one of the first urban "freeway revolts" in the United States, the California Division of Highways hired landscape architecture firm Lawrence Halprin and Associates to study a portion of the city's contested freeway plan. The firm was assigned to reimagine the proposed "Panhandle Freeway" as a contemporary landscaped parkway, in order to demonstrate that a freeway could be an engaging public resource rather than a despoiler of the city's unique beauty.

By the time the firm was hired, city/state politics surrounding the project were deeply entrenched: with local residents and city supervisors on one side, state engineers and downtown businesses on the other, and a few city officials attempting to mediate between the two.[2] As designers, public, and government officials reimagined, defended, and contested the freeway environs, tensions among them – between disciplinary and everyday knowledge and between abstract and lived understandings of urban sites – would be all too apparent. Given such

[1] Lawrence Halprin, *Freeways* (New York: Reinhold Pub. Corp., 1966), 55.
[2] San Francisco city planners, traffic engineers, the park administrator, and eventually Halprin's firm all found themselves playing mediating roles in this project. While most endorsed the general idea of a freeway through this area of the city, they also frequently sought to temper its impacts, sometimes opposing specific proposals.

contradictions, the Halprin team's proposals were more or less doomed from the start.[3] Yet as they failed to approve any freeway, these different parties created something else. Emerging through this process was a more synoptic understanding of the city: as a complex living whole, composed of numerous interrelations between people, trees, streets, houses, winds, and histories.

Broadly stated, this new understanding involved redefining the urban landscape from a matter of aesthetics to a matter of environment. The Panhandle Parkway study initially emerged out of concerns for the city's scenic beauty, reflecting a tendency at the time to identify the indefinite qualities of built environments on that basis.[4] By the mid-1960s, however, notions of aesthetics and beauty were increasingly stretched to encompass an ever-expanding set of social and ecological concerns – issues that would soon be reconceived as matters of "the environment." Lady Bird Johnson, initiator of the 1965 Highway Beautification Act, offered a particularly clear articulation of this expansion when she wrote:

> Getting on the subject of beautification is like picking up a tangled skein of wool: all the threads are interwoven... recreation and pollution and mental health, and the crime rate, and rapid transit, and highway beautification, and the war on poverty and parks -- national, state, and local. It is hard to hitch the conversation into one straight line, because everything leads to something else.[5]

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[3] Most historical accounts of the San Francisco Freeway Revolt have regarded it as a political history, focusing on the extensive maneuvering that took place in negotiations between city supervisors and the state. I will forgo such details here, except when relevant, since they are myriad and have been covered elsewhere. See William Issel, "Land Values, Human Values, and the Preservation of the City's Treasured Appearance: Environmentalism, Politics, and the San Francisco Freeway Revolt," *The Pacific Historical Review* 68.4 (1999), 611-646; Katherine Johnson, "Captain Blake versus the Highwaymen: Or, How San Francisco Won the Freeway Revolt," *Journal of Planning History* 8.1 (2009), 56-83.

[4] Evocations of beauty were not only common in discussions regarding regional planning and urban development at this time, but they were also part of highway debates: discourse regarding the need for "roadside beautification," for example, gained traction among engineers, designers, and activists starting in the 1930s. Christopher Wells, *Car Country: An Environmental History* (University of Washington Press, 2013), 216.

[5] Though the book containing this passage was published in 1970, Johnson had written it in 1965. While the Highway Beautification Act has typically been considered Johnson's most significant environmental action as first lady, more recently she has been recognized as a major influence on a broad range of

When Halprin's firm was hired to redesign the Panhandle Freeway in 1962, Johnson's notion that "everything leads to something else" was nascent in San Francisco's public discourse. Indeed, the very meaning of the term "environment" was in formation during these years: it was not yet a popular political rallying cry, nor was it used to identify cities as dynamic natural systems. In fitting with this larger context, none of the parties involved in the Panhandle Freeway debates had yet conceived of the freeway surrounds on environmental terms. By 1964, however, that conception would become central to discussions of the freeway, and of the urban fabric. In the two intervening years a broad reconceptualization of urban landscape would occur: through recalibrations of language, and also through new ways of seeing, drawing, quantifying, and imagining.

In the Panhandle Parkway study and debates, this process of redefinition manifested diversely, through newspaper articles, statistics, design drawings, protest events, and public hearings. In what follows, I fold together these different communications: analyzing rhetoric, techniques, and methods to show how designers, urbanites, and government officials contested and reconstructed the urban on newly environmental terms. This involved new definitions for existing words, new quantifications of everyday urban objects, and new ways of thinking across the many spatial scales at which urban infrastructures, economies, and cultures operate.

I also track unresolved tensions that emerged in this broad reimagining, regarding the challenges of translating between visual and verbal languages, the roles of designers within public process, and the capacity of modernist design techniques and methods to engage emergent

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environmental laws passed under the Johnson Administration. Lady Bird Johnson, *A White House Diary* (New York: Holt, Rinehart and Winston, 1970), 234; Lawrence Wright, "Lady Bird's Lost Legacy," *New York Times*, July 20, 2007; Keller Easterling, *Organization Space: Landscapes, Highways, and Houses in America* (Cambridge, Mass.: MIT Press, 1999), 114-117.

environmental models.[6] For Halprin and his team, this project catalyzed a reckoning regarding how to design at large scales, and relative to political controversy. Over the course of the Panhandle debates, the team struggled at times to explain the values and ideologies embedded in their design practice to a community questioning their authority and intent. And by the Panhandle debate's end, local residents' conceptions of urban nature outpaced the Halprin team's own ability to envision the city on environmental terms: protesters' emergent visions saw the city as something more public and more discursive than the firm's drawing practices supported, and operated at a scale much greater than the firm was accustomed to visualizing. How could one show the city, not as a collection of inert forms, but as a complex series of living, dynamic relationships? To what degree could urban conditions be measured, and to what degree did they transcend measurability?[7] What were the ramifications of engaging city as a system versus as a community?[8] Questions such as these would pose new challenges to the Halprin team's design practices, impacting both the spatial and political dimensions of their work.

The Panhandle Freeway was a uniquely productive site for expanding public discourse regarding freeways and urban design: because it was poised to impact the city's most iconic park and one of the city's most racially progressive neighborhoods, debates over its design brought

[6] In order to explore this particular controversy in breadth, this chapter decenters its designer-subjects to a degree. I do not delve deeply into Lawrence Halprin's personal design approaches or his firm's broader historical trajectory, but rather focus on the drawing practices, statements, and strategies that his team used in dialogue with engineers and urbanites throughout the Panhandle project and debates. For more on Halprin's oeuvre, see Alison Bick Hirsch, *City Choreographer* (University of Minnesota Press, 2014); Kathleen John-Alder, "A Field Guide to Form: Lawrence Halprin's Ecological Engagement with The Sea Ranch," *Landscape Journal* 31.1-2 (2012), 53-75.

[7] For more on tensions between measurement and immeasurability in 1960s-70s environmentalism, see Michelle Murphy, *Sick Building Syndrome and the Problem of Uncertainty: Environmental Politics, Technoscience, and Women Workers* (Duke University Press, 2006).

[8] Regarding twentieth-century tensions between community and systems models of living environments, see Gregg Mitman, *The State of Nature: Ecology, Community, and American Social Thought, 1900-1950* (University of Chicago Press, 1992).

together a unique coalition of environmentalists and civil rights activists.[9] Transcending what would be described today as NIMBYism, their cumulative arguments against the freeway instead reconceptualized the urban surrounds as something more universal than a collection of residences or concentration of plants: it was a site of public life, lived space, and caring for urban nature. Through the Panhandle Freeway debates, those involved would shift their focus: from protecting their city's scenic beauty, towards defending the urban environment as "a great functioning whole."[10]

From Freeway to Parkway: Growing Controversy and the Work of Halprin and Associates

To understand the history of the Panhandle Parkway, we must start fourteen years prior to its conception. In 1948 the San Francisco Department of City Planning oversaw the creation of a San Francisco Trafficways Plan (Figure 2.1). In anticipation of ongoing increases in automobile use, the plan knit an extensive network of freeways and major thoroughfares throughout the city.[11] In 1950 the State Division of Highways began implementing that plan: as part of a statewide push to extend highway networks into cities, they began building Interstate Route 101 (I-101) north from its terminus at the city's edge. In 1953, after the San Francisco Board of

[9] The Bay Area was arguably a perfect laboratory for developing an urban environmentalist culture, given its close proximity to undeveloped coastal lands and the strong influences of weather and topography on everyday life in the city. When discussing the history of Bay Area environmentalism, Richard Walker introduces the notion of the "ruralized city" to describe San Francisco's extensive incorporations of open land within the city. Richard A. Walker, *The Country in the City: The Greening of the San Francisco Bay Area* (University of Washington Press, 2009), 5.

[10] Ari Kelman describes the development of a similar collectively defined social/environmental vision in New Orleans, in the late 1960s. Ari Kelman, *A River and its City: The Nature of Landscape in New Orleans* (Univ of California Press, 2003), 197-222. See also Chapter Five.

[11] San Francisco's planning department was a lean operation at this time, so the plan was created largely through the work of De Leuw Cather & Co, Consulting Engineers, and Ladislas Segoe, Consulting City Planner. This plan would remain largely the same when he Department of City Planning incorporated it into the 1951 San Francisco Master Plan. Panhandle Freeway Revolt, San Francisco Ephemera Collection, San Francisco History Center of the San Francisco Public Library.

Supervisors' reluctant approval, the state began construction of the Embarcadero Freeway, extending west from the Bay Bridge along downtown's northern waterfront edge.

Over the next several years, Embarcadero Freeway construction and local freeway resistance developed hand-in-hand. As alarmed local residents watched the massive two-deck structure dwarf the city's landmark Ferry Building and sever the waterfront from downtown (Figure 2.2), more and more portions of the proposed freeway system came under local fire. In 1954, San Francisco's Recreation and Parks Commission officially stated their opposition to the Trafficways Plan's Panhandle Freeway, fearing its encroachment on parklands. In June 1956, a week before President Eisenhower passed the Federal-Aid Highway Act into law, the San Francisco Board of Supervisors heeded local protests in the city's southwestern corner by officially declaring opposition to the plan's Western Freeway, intended to link the city's western side to Golden Gate Bridge.[12]

In 1959, with the Embarcadero Freeway nearly complete, the city's Board of Supervisors initiated what would henceforth be referred to as the "San Francisco Freeway Revolt," with a resolution opposing the construction of seven of the ten freeways proposed in the Trafficways Plan.[13] Following this resolution, intergovernmental and public debates regarding various portions of the proposed freeway system continued with heightened fervor. In local government

[12] The supervisors' resolution was later vetoed by the mayor, but nonetheless became influential in later freeway debates, often cited by protesters and supervisors alike as the earliest moment of local resistance to State freeway plans. For more details on the Federal-Aid Highway Act, see Chapter One.

[13] Although the original Trafficways Plan had been commissioned by the city, the Eisenhower Act put responsibility for its implementation in the hands of the state. As a result, the city's freeway plan was largely attributed to the state from the late 1950s-on. Although city approval was not officially required for state freeway construction in the 1950s and early 60s, city governments could stop state freeway construction by refusing to close existing roads in the freeway's path. In this circuitous manner, the Board of Supervisors had the power to cancel freeway plans.

forums, citizen letters, and newsprint, officials, residents, and journalists increasingly depicted freeways as concrete monstrosities threatening to destroy the unique beauty of their beloved city.

In late 1959, the Panhandle Freeway was brought to the forefront of public debate. This portion of the freeway system was to complete the routing of I-101 through the city: extending from the Interstate's terminus at Civic Center, west through Panhandle Park, and through Golden Gate Park, then continuing northward to connect with I-101 on the Golden Gate Bridge (Figure 2.1, marked in green). Because it was slated to cut through the northeast corner of Golden Gate Park and occupy the entirety of Panhandle Park, the Panhandle Freeway quickly became a flashpoint for public debate regarding the value of open space in the city.

Golden Gate Park was beloved as both a recreational space and an iconic element of San Francisco's history and identity. Originally conceived as an equivalent to New York City's Central Park, Golden Gate Park was built in the 1870s over sand dunes, in order to promote residential development along what was then the city's western edge.[14] Panhandle Park, meanwhile, was a uniquely narrow strip of landscape with a mixed history of use. It was originally a formal carriage-ride entry into Golden Gate Park, and was also used by the park's designers as a testing ground for tree planting and dune stabilization. Eventually the carriage road was removed from the park's center, and replaced with open lawn. Its trees, meanwhile, including over twenty species of Eucalyptus, grew tall and towering. In the 1960s, some areas of the park were everyday destinations for area residents: a uniquely mixed-race playground was particularly well used by inhabitants of the adjacent Haight-Ashbury neighborhood.

[14] Philip J. Dreyfus, *Our Better Nature: Environment and the Making of San Francisco* (University of Oklahoma Press, 2012), 67-100; Gray Brechin, *Imperial San Francisco: Urban Power, Earthly Ruin* (Univ of California Press, 1999), 80-84.

Immediately to the south of Panhandle Park, "the Haight" was fast becoming a new local center of Beat culture in the 1960s, and was soon to become the epicenter of a nationwide hippie movement.[15] In the 1950s-60s the neighborhood was notably well organized, in part due to the activism of the Haight-Ashbury Neighborhood Council (HANC). In contrast to prevailing attitudes in other San Francisco neighborhoods at the time, HANC actively promoted racial integration throughout the 1960s: supporting the arrival of black families displaced by nearby freeway-related redevelopment, and engaging in efforts to prevent white flight.[16]

Given its culturally, environmentally, historically, and politically rich context, the Panhandle Freeway seemed unlikely to gain the approval of city supervisors. Indeed, by 1961, they were poised to cancel the Panhandle Freeway proposal, as they had already done with other portions of freeway.[17] At the end of that year, however, the focus of the freeway debate began to shift, giving the Panhandle proposal new life. That month, an editorial by the writers at the city's *News Call Bulletin* argued that the Panhandle Freeway could actually be reconceived as a parkway, one that "would move traffic through a landscaped terrace with trees, grass, adjacent

[15] One of the city's earliest neighborhood organizations was the Panhandle Improvement Club, founded in 1888 and located in what would become the Haight-Ashbury. The Panhandle would become a center of Hippie activity beginning in 1965, very shortly after the Panhandle Freeway project. Stephen E. Barton, "The Neighborhood Movement in San Francisco," *Berkeley Planning Journal* 2.1 (1985), 87.

[16] Damon Scott describes how the neighborhood's civil rights activism was a matter of idealism for some, and a matter of preserving property values for others. Scott also details how the neighborhood's racial progressiveness was countered by heteronormative exclusion, as neighborhood residents protested the opening of a gay movie house in the neighborhood in May 1964. This highlights a fundamental problem of Panhandle protesters' collective arguments regarding the rights of all urban dwellers: the very act of invoking holism can serve to mask exclusions. Damon Scott, "Before the Creative Class: Blight, Gay Movies, and Family Values in the Haight-Ashbury Neighborhood, 1964," *Journal of Planning History* 14.2 (2015), 149-173. Regarding neighborhood efforts to maintain a racially integrated neighborhood, see Barton, "The Neighborhood Movement in San Francisco," 93.

[17] In 1962 city supervisor William Blake proposed that in lieu of the Panhandle route the state should construct a tunnel under Pacific Heights, thereby connecting the state's southern and northern portions without defacing the city's urban fabric. Although the construction of the "Crosstown Tunnel," as it was called, was far from certain, supervisors' support for a study of the tunnel option signaled that they might soon decide to cancel the Panhandle Freeway. Johnson, "Captain Blake Versus the Highwaymen."

playgrounds and walkways, creating a pleasing new environment."[18] This proposal directly addressed local fears of another concrete Embarcadero Freeway: suggesting that freeways might support, rather than threaten, the city and its inhabitants.

The San Francisco Freeway debate had already undergone many political twists and turns by this point, yet the terms of the debate had remained quite consistent. Those in support of the freeway – primarily downtown businesses, state highway officials and engineers, and suburbanites – tended to argue in support of downtown commerce, the city' economic growth, and relieving traffic congestion. Those against freeway construction – residents of threatened neighborhoods, housing advocates, several city supervisors – cited a loss of homes and resulting reduction in city property taxes, and potential loss of the city's unique beauty and "treasured appearance."[19] The proposed "parkway" approach to the freeway, however, introduced a new angle on the problem, which in turn would soon catalyze new discourse.

While city supervisors appeared unimpressed by the Panhandle Parkway idea, the mayor, city planners, and city traffic engineers expressed enthusiasm. A day after the proposal, San Francisco's Director of Planning James McCarthy was quoted invoking the 1906 city plan of Daniel Burnham, which had also envisioned "a green swath from the Panhandle to City Hall."[20] City Engineer Clifford Geertz concurred, stating "the prospect of bringing a green strip along

[18] "A Freeway that CAN be Built," *San Francisco News Call Bulletin*, December 21, 1961. The editors of local newspapers crafted many influential narratives regarding San Francisco freeways, and were overtly biased in their campaigns for or against freeways. Regarding the Chronicle's exercise of such bias regarding environmental issues, see Scott Newhall, "A Newspaper Editor's Voyage Across San Francisco Bay: San Francisco Chronicle. 1935-1971, and Other Adventures," an oral history conducted in 1988-1989 by Suzanne B. Riess, Regional Oral History Office, The Bancroft Library, University of California, Berkeley, 1990, 246-247.

[19] Such references appear in several articles and Supervisor statements from the time, and are even written into Supervisors' legislation; William Issel highlights such discourse in Issel, "Land Values, Human Values, and the Preservation of the City's Treasured Appearance."

[20] "New Interest in S.F.'s Freeways," *San Francisco News Call Bulletin*, December 22, 1961.

with the freeway, to convert it into a real parkway, is very appealing."[21] Observing this enthusiasm, the State Division of Highways proposed to hire a nationally renowned landscape architect to work together with their regional office and the city on a new vision for a Panhandle Parkway.

In early 1962, anticipating the supervisors' approval, the state hired Lawrence Halprin and Associates for the project. Given the freeway controversy, Halprin's firm was a strategically savvy choice. They were established and respected, having worked throughout the 1950s on master plans for University of California campuses in Davis and Berkeley, as well as high profile landscape projects throughout the country. At the same time, the firm was embedded in San Francisco culture. Their office was located in the city, in a former warehouse by the San Francisco piers, with a view of Coit Tower and the rugged slope of Telegraph Hill (Figures 2.3, 2.4). Halprin and his wife, choreographer Anna Halprin, were enmeshed in the local San Francisco arts scene: they often hosted collaborative events on the dance deck at their Marin County home and other outdoor sites, exploring human/nature interconnection as a recurring theme (Figure 2.5).[22] As a respected professional who also embraced the cultural experimentation and nature-orientation of San Francisco's 1960s artistic culture, Halprin was essentially poised between the realm of state highway engineers and that of local freeway

[21] Ibid.

[22] The Halprins' ongoing collaborations were closely related to the music and visual work of their Bay Area cohort. Artists in the San Francisco Bay Area developed a particularly nature-centered interpretation of improvisation during this time, crafting an intrinsic link between chance, creativity, and the natural world. Tony Martin, a San Francisco Tape Music Center member and occasional collaborator with Anna Halprin, demonstrated this combined interest when he commented: "I always felt that I was using 'chance plus choice' and that most of my music was generated out of that feeling. It was nature plus me as a piece of nature." Martin was a member of the San Francisco Tape Music Center, which shared studio space and occasionally collaborated with Anna Halprin. David W. Bernstein, *The San Francisco Tape Music Center: 1960s Counterculture and the Avant-Garde* (Univ of California Press, 2008), 154.

protesters. For this reason, state officials likely saw his firm as uniquely equipped to mediate local-state conflict over freeway plans.

In June of 1962 the Board of Supervisors passed a resolution supporting the proposed joint city/state study of the Panhandle route, with Halprin's firm to ensure that "any new surface traffic arteries will enhance, not destroy, property values and the over-all picturesqueness and beauty of the city." Shortly after, the State Division of Highways convened the first meeting of the Panhandle Parkway & Crosstown Tunnel Study team, which included a handful of engineers in the California Division of Highways, San Francisco's Director of Planning, Director of Public Works, and General Manager of the city's Recreation and Parks Department, and Halprin and Associates.[23] The team agreed to meet regularly and provide updates to the San Francisco Supervisors and their streets committee every 90 days. Their work was to culminate in public presentations to the California Highway Commission and the San Francisco Board of Supervisors regarding potential designs for the Panhandle/Golden Gate Freeway, and an alternate tunnel route in the city's northeast.[24] The Highway Commission and Board of Supervisors would each independently weigh in on these routes' proposed designs.

[23] This team was technically divided into three groups, each with different levels of oversight. The greatest oversight belonged to a handful of engineers in the California Division of Highways, led by the State Highway Engineer. Second was a coordinating committee chaired by C.F. Greene, District Engineer for Division of Highways District IV, and comprised of San Francisco's Director of Planning Director of Public Works, and the General Manager of the city's Recreation and Parks Department. Third was Halprin and Associates, as the hired consultant.

[24] The "Crosstown Tunnel" route was proposed by city supervisor William Blake, and at this point its structural feasibility was untested. Discussion surrounding the tunnel was both more politicized and less focused on design than the Panhandle discussion, and the Halprin team's work on it was minimal; I therefore minimize discussion of it here. San Francisco Board of Supervisors, Resolution 326-62, June 11, 1962. For more on the tunnel, see Johnson, "Captain Blake versus the Highwaymen."

In March 1963, state engineers initiated the firm's work, sending Halprin's office an initial series of route options for evaluation.[25] The studies divided the parkway into three sections: from Civic Center through Panhandle Park; through Golden Gate Park; and between Golden Gate Park and the Presidio along Park-Presidio Avenue (Figure 2.6). In this sense, the road's overall location was set. The task before Halprin's team was to evaluate the aesthetic potentials and impacts of different configurations along this route, such as whether to locate the parkway directly through the narrow Panhandle Park or along its edge; where and how it should cross Golden Gate Park, and what the effects would be of elevating, depressing, or tunneling the parkway through different parts of its route.

The firm's Panhandle team primarily consisted of Halprin, associate Don Carter, and John Evans, a young architect who had recently joined the office.[26] Several other designers would work on the project at different phases, including associate Jean Walton, and designers Roger Osbaldeston and Dennis Wilkinson.[27] This arrangement was characteristic of how Halprin's office generally functioned: Halprin typically worked closely throughout the design process with one supporting designer per project, and other designers were brought in to assist at different times, particularly when it came time to produce presentation drawings.[28]

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[25] Although no archival data has been found that explains the source of these particular layouts, the numbering sequence shows that state engineers initially delivered a very standard design – a broad, ground-level, eight lane road – and then they tested more complex arrangements in response to critiques provided by Halprin's team.

[26] Evans briefly recounts his work on the project in an interview with Ken Fieldhouse, "Brushing Aside the Cobwebs," *Landscape Design: Journal of the Landscape Institute* 304 (2001), 34-36.

[27] Roger Osbaldeston remembers working on drawings for the project, and recalls that Wilkinson made the final drawings. Archived time sheets from the project show initials for all individuals mentioned here, plus more. Conversation with Roger Osbaldeston, January 31, 2015; 014.I.A.4946, Lawrence Halprin Collection, The Architectural Archives of the University of Pennsylvania.

[28] Because many different Halprin employees were involved in this project at different phases and neither drawings nor writings were typically signed, in this chapter I typically refer to the project designers as "the Halprin team," identifying and discussing specific individuals when it is possible to do so. Richard

Upon receiving route proposals, the Halprin team diagrammed each option with a large plan-view drawing, roughly two feet tall and seven feet long (Figure 2.7). In these quick and loose plans, the team marked the freeway form, edges of city blocks and parks, changes in grade, and the exposed backs of houses where portions of city blocks were to be removed. To supplement these plans, they sketched measured sections: in marker on the edges of the plan diagrams (Figure 2.7, upper right corner), and also on separate large sheets of trace paper. Notes on the drawings, written in different inks and different hands, were likely marked during conversation as Halprin, Carter, Evans, and others gathered to discuss and analyze various configurations (Figure 2.8).[29] These notes addressed the impacts of freeway widths, elevations, and adjacencies on surrounding noise, redevelopment potential, aesthetics, park access, and relations of scale: commenting, for example, that one freeway configuration was "too large and impenetrable," with "large cut and fill structures out of character in this residential area," and with a "retaining wall [of] 8 feet. If the level of the freeway were reduced it would be less obvious & the spread of sound lessened" (Figure 2.7).

After drawing through each scheme, the Halprin team delivered written commentaries to the Parkway Study team. These identified benefits and disadvantages in each case of depressing or elevating structures, occupying parkland or residential blocks, using tunnels, and locating the freeway in different positions, for example locating the entire road to one side of Panhandle Park versus splitting it along both sides. Their overall analysis of the state's first layout proposal was

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Haag has recollected working one-on-one as the assigned designer under Halprin, and has also described the office's supportive, collective environment regarding the work of drawing. "Richard Haag Oral History," interviewed by Charles A. Birnbaum and Nancy S. Slade. The Cultural Landscape Foundation, 2014, 38-40. https://tclf.org/sites/default/files/atoms/files/Haag_Transcript.pdf (Accessed July 21, 2017).

[29] It was common in Halprin's office to advance a project by gathering around drawings and discussing them. Numerous photographs from Halprin's office show such conversations. "Photographs LHA Staff and Contact Prints," Lawrence Halprin Collection, The Architectural Archives of the University of Pennsylvania. See also comments by Richard Haag, Ibid.

that the scheme provided "good driving conditions but very little visual interest." It would also be difficult to integrate into the existing neighborhood: taking a large amount of private property, leaving little room for "screen planting," and having a width that would "be a physical and visual barrier to the pedestrian."[30] In analyses such as this, the team considered the freeway from all angles, evaluating its potential residential and landscape impacts, aesthetics, and coherence relative to the surrounding neighborhood.

Over the coming months, the Halprin team delivered several such analyses to state engineers, who responded by delivering new variations to Halprin's office for consideration. Panhandle Park options included a version that stacked freeway lanes so that their footprint through the city would be slimmer, and one that depressed eastbound and westbound lanes on either side of the park, cantilevering existing streets over them. Golden Gate Park options included a route that tunneled through the northeastern edge of the park so as to disturb as little developed parkland as possible, and a cut and cover tunnel under the park's Main Drive. These iterative studies of different route variations continued for several months: by fall 1963 the Halprin team had evaluated more than a dozen such layouts.

Privately Practicing, Publicly Defining the Freeway "Environment"

While the Halprin team was evaluating various potential routes, they were also producing a series of sketch studies of freeway edge configurations, and articulating their overall vision for urban freeways in writing. Together, these sketches and writings demonstrate the nuanced and variable transformations that the firm's practices and thinking underwent during this time. Halprin's team didn't yet have a way to detail the freeway surrounds, in language or image: this

[30] Project notes, 014.I.A.763-.775a, Lawrence Halprin Collection, The Architectural Archives of the University of Pennsylvania.

project constituted a period of experimentation and discovery, during which the designers mixed together familiar influences with new ideas. In sketching, they would use familiar drawing practices that manifested modernist notions of human/nature interconnection, in which both designing and inhabiting landscape space were means of connecting with the holistic qualities of a living site. In writing they would deploy the term "environment," using it to identify in the freeway surrounds the kind of dynamic interrelationship that already imbued their modernist design practices.[31]

In their sketched studies of potential spatial configurations at the freeway's neighborhood edges, Halprin's firm engaged attitudes and techniques typically practiced in the U.S. modernist landscape movement of which they were a part.[32] This movement understood everyday human spatial experience as manifesting human-nature relationships, and engaged design as a means for improving the holistic qualities of those relationships.[33] The designers who worked for Halprin had often studied and apprenticed in this approach, and Halprin himself had contributed to its

[31] In the early 1960s, Halprin did not have a consistent approach to conceptualizing the environment: he was beginning to make regular use of the term, and defining it through use. In *Cities* for example, published in 1963, Halprin described the environment variously, sometimes in ways that contrasted the vision that he articulated in connection to the Panhandle Freeway. For example, at one point he described "the environment" simply as "an envelope within which movement takes place," stating that it "exists for the purpose of movement." Also in 1963, Halprin presented a paper entitled "Wilderness in the City" at a San Francisco Wilderness Conference. He was beginning to discuss ecology during these years as well, though during this time he preferred, somewhat idiosyncratically, to use the term "oecology." Halprin's reasoning for this was not fully detailed, but it seems he saw this older version of the term as more culturally and historically rich than the contemporary spelling. Lawrence Halprin, *Cities* (New York: Reinhold Pub. Corp, 1963), 209; Judith Wasserman, "A World in Motion: The Creative Synergy of Lawrence and Anna Halprin," *Landscape Journal* 31.1–2 (2013), 33–52; Lawrence Halprin & Associates, Landscape Architects, *Peacock Gap: A Preliminary Report on its Oecological Development* (1963), 014.I.A.2003-.2012, Lawrence Halprin Collection, The Architectural Archives of the University of Pennsylvania.

[32] See the discussion of modernist design in Chapter One.

[33] During this period, Halprin's personal drawing practices and his firm's design practices were both beginning to innovate well beyond the more traditional approaches and techniques discussed here. Nonetheless, the representational approaches that the Halprin team used in the Panhandle studies were more conventional, and in fitting with Halprin's modernist roots.

development.[34] While a student at the Harvard Graduate School of Design (GSD) from 1942-44, Halprin had paid more attention to the modernist design work of his classmates in architecture than to the Beaux-Arts curriculum that then held sway in his own program.[35] In this, he participated in an emergent modernist landscape agenda alongside his then instructor Christopher Tunnard; with his GSD predecessors of just a few years, Garrett Eckbo, Dan Kiley, and James Rose; and with a handful of others, such as California landscape architect Thomas Church, whose firms were actively developing modernist approaches to landscape design.[36] Eckbo articulated this perspective in his 1950 text *Landscape for Living*, connecting the designer's

[34] Halprin's employees often arrived at his office after completing studies at institutions with modernist design curriculums. Several young designers in Halprin's office in the early-mid 1960s, for example, had graduated from the University of Pennsylvania in the late 1950s, a period during which Garrett Eckbo and Roberto Burle Marx each taught as visiting professors. Halprin employees also tended to circulate between his office and those of his modernist contemporaries, such as Dan Kiley. Conversation with Roger Osbaldeston, June 3, 2012; Curriculum Documents and Student Work, 1958-1999, The Architectural Archives of the University of Pennsylvania.

[35] Later in life Halprin would say that while at the GSD, he avoided the Beaux-Arts based landscape architectural curriculum as much as possible, and spent much of his time hanging out with and assisting architecture students: regularly having Friday night drinks with Philip Johnson, listening to lectures by a visiting Laszlo Moholy-Nagy, and taking field trips with Marcel Breuer. The notable exception to the landscape architecture department's Beaux-Arts leaning at that time was visiting professor Christopher Tunnard, whose modernist outlook inspired Halprin as a student. "Lawrence Halprin Oral History," interviewed by Charles A. Birnbaum and Tom Fox. The Cultural Landscape Foundation, 2008, 8. https://tclf.org/sites/default/files/atoms/files/Halprin-Transcript.pdf (Accessed July 21, 2017). For more on departmental dynamics and student experiences at the GSD during this period, see Anthony Alofsin, *The Struggle for Modernism: Architecture, Landscape Architecture, and City Planning at Harvard* (WW Norton & Company, 2002).

[36] This trio together played prominent roles in initiating modernist landscape architectural design in the United States, as did the San Francisco-based Church. After graduating from the GSD, Halprin fought in World War II for two years, after which he joined his wife Anna in San Francisco. William Wurster, whom he had befriended at the GSD, introduced him to Thomas Church. Halprin worked for Church from 1944-1949, at which point he opened his own firm. Accordingly, Halprin's comments regarding Church reflect both Halprin's own perspective, and modernist landscape architectural perspectives more broadly. Church was a particularly significant influence, as Halprin worked closely with him for several years before leaving to open his own firm. Marc Treib, *Modern Landscape Architecture: A Critical Review* (MIT Press, 1993); Thomas Dolliver Church, Grace M. Hall, and Michael Laurie, *Gardens are for People* (Univ of California Press, 1995); Lawrence Halprin, "A Landscape Architect's Appreciation of Church's Place in Environment Design History," in *Thomas Church, Landscape Architect*, interviews conducted by Suzanne B. Riess, Regional Oral History Office, The Bancroft Library, University of California, Berkeley, 1978.

measured configuration of site elements with a qualitative, experiential, and fundamentally relational connection between humans and a much larger milieu:

> The function of landscape design is more than the direct design of outdoor space arrangements. In the larger sense it is the continuous establishment of *relations between* man and the land, tying in those hills and valleys and broad panoramas which are beyond design, through designed elements which establish a scale relation between each individual human and the large landscape, placing them so that that individual gets a maximum experience from the relationship.[37]

In accordance with this perspective, the designers in Halprin's firm used drawing to attune to the experiential aspects of scale, enclosure, topography, continuity, adjacencies, and juxtapositions; and to cultivate and hone strategies for altering them. Furthermore, they conceived of these qualities as a series of encounters that together manifested experiential interconnection between people and landscapes.[38] In the Panhandle project, this approach was most apparent in the series of 8.5x11 pen and paper sketch studies that the team used to test specific freeway design details, such as signage, lighting, planting density, configurations of retaining walls, and locations of fences.[39] Figures 2.9, 2.10, and 2.11 are examples of these

[37] This quote articulates a slightly earlier understanding of the details of human/landscape relationship, and Halprin likely would have argued that Eckbo's formalistic notion of placement as an essential element of design was problematically simplistic. Halprin considered Eckbo's design work to be too formalistic. This may have been in part because Eckbo tended to understand the human/landscape relationship as something defined by vision, while Halprin leaned towards a more multi-sensory understanding of spatial experience. Connected to this, Halprin's often described landscape in more holistic terms than those that Eckbo uses here. Garrett Eckbo, *Landscape for Living* (Univ of Massachusetts Press, 1950), 6. Lawrence Halprin, "A Landscape Architect's Appreciation of Church's Place in Environment Design History," 733-734. See also Marc Treib and Dorothée Imbert, *Garrett Eckbo: Modern Landscapes for Living* (Univ of California Press, 1997).

[38] Regarding Church's significance in the field of landscape architecture, Halprin said, "he has impressed on the world the notion that people's lives are enhanced by gardens and houses which are linked together as a unity – as a kind of inevitable living and aesthetic synergy." Lawrence Halprin, "A Landscape Architect's Appreciation of Church's Place in Environment Design History," 755.

[39] Thirty-seven such sketches can be found in the Panhandle Freeway project files from Halprin's office; whether these were all such sketches is unknown. 014.I.A.763-.775a, Lawrence Halprin Collection, The Architectural Archives of the University of Pennsylvania.

sketches.[40] They all addressed the same freeway arrangement: a pedestrian bridge over the freeway, a paved pedestrian path alongside the freeway, and a series of retaining walls negotiating a grade change between pedestrian and traffic zones. Each sketch focused on one possible configuration of trees, shrubs, walls and fences: cross-referencing different drawing types to explore how those elements could enclose, screen, and mediate between pedestrian ways and freeways.[41]

How did such combinations of drawings enable designers to understand the freeway site as a holistic manifestation of human/nature relationship? This was cultivated through specific skilled actions of drawing, measuring, and evaluating. First, the designers were well trained in using sections, perspectives, bird's-eye views, and plans as tools for generating and decoding information about the site and its potentials. Later in the design process, such drawing types would be used to present resolved design ideas. In early design phases, they were used not to illustrate but to test: to investigate still-nebulous design possibilities and explore how elements of the site might come together; such as how various uses of walls and planting configurations would screen a pedestrian's view of cars and fences differently (Figure 2.11, bottom left).

Such testing only works, however, if the designer has developed certain sensitivities to the convention of the section drawing. One of these is an internalized sense of scale. A section drawing with inaccurately scaled elements relative to real-world conditions is useless, because the designer will not be able to evaluate configurations as they would be built.[42] Another such

[40] Figures 2.9 and 2.11 were almost certainly by Halprin: his distinctive drawing and handwriting are identifiable in both. As the main designer working with Halprin throughout, Evans is the most likely candidate for the third sketch, though it is certainly possible that it was drawn by someone else.
[41] These sketches demonstrate the Halprin team's focus on pedestrian experience alongside the freeway, which they presumably associated with the everyday experiences of neighborhood residents.
[42] A designer might use a scale ruler to draw a loose section, in order to confirm the accuracy of their proportions. Even when using a ruler, however, the designer would deploy known sizing: for example,

sensitivity is awareness of how different spatial combinations feel in the real world, such that one can sense how proportions shown in a section would feel to a pedestrian. The fact that the shrub beside the pedestrian in Figure 2.9 was drawn to just above the top of their head demonstrates such sensitivity: the designer would have been well aware of how a shrub at that height would screen views and effect a sense of enclosure. By drawing on such internalized, habitual attunement, Halprin's team could efficiently and effectively use section drawings as technical tools for evaluating still unformed design ideas.

Second, designers would frequently oscillate among drawing types: creating, for example, a section sketch above a bird's-eye view (Figure 2.9), or a perspective above a plan (Figure 2.10).[43] Each of these drawings showed something that another did not. The plan in Figure 2.10, for example, could demonstrate the experiential interest and opportunities for pause afforded by a varied sidewalk edge. In plan, the designer could see how that arrangement would unfold to a pedestrian walking through the space; such information was not visible in the section's static, momentary slice. Meanwhile, the three-dimensional qualities shown in a bird's-eye view or perspective could yield a more total sense of how the space's adjacencies and enclosures would work together. Each drawing would demonstrate proportion and scale in different planes and at

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they would know to draw a person roughly 5.5 feet tall, would be aware that seating is usually roughly eighteen inches high, and would have in mind the range of sidewalk widths that are comfortable in different circumstances.

[43] The section located a pedestrian standing on a typical (roughly five-foot) sidewalk, beside a roughly two-foot retaining wall planted with shrubs reaching just slightly taller than the top of the pedestrian's head. Halprin drew the lower side of this planter several feet high, and below it a loosely graded, steep slope planted with small trees extending down to the freeway. The bird's-eye view demonstrated how the planter shown in section was situated adjacent to other elements: on the lower side a chain link fence mostly obscured from pedestrian view by shrubs, and on the other side an open, low-walled a pedestrian walkway passing over the depressed freeway.

different angles; by oscillating between drawing types, designers could cultivate a more complete understanding of their initial ideas, and further develop the design.[44]

For landscape architects using these techniques, a design could only be fully understood in the combination of drawings. Because of this, and because drawings were moments in ongoing discovery, the design-in-process arguably existed most fully outside the drawings altogether, in the evolving awareness of the whole that the designer actively developed via cyclical acts of imagining, drawing, and discussing. Throughout the design process, designers would generate constellations of drawings that could serve as interconnected partial markers of a site's potential. They would learn from that collection of markers, and then engage the process again. In this way of working, the designer's task was to envision, measure and draw – and thereby mediate and orchestrate – the site's becoming.

Through this imaginative, aggregate evolution of a future landscape, the designer's role in design process performed the very embedded perception of natural holism that – as Eckbo's quote articulates – they understood to be characteristic of the site they were designing. What's more, these practices would enact the site as something both measurable and immeasurable: discrete aspects could be understood in precise scalar terms, but the entirety of the site design, as something continually mediated and changing, operated more as an unquantifiable whole.[45] This

[44] Halprin loosely described aspects of such processes of drawing and testing (referred to as "valuaction") in his 1970 book *RSVP Cycles*. That said, the book's discussion of scores reflects design approaches that Halprin largely developed after the Panhandle study, so its relevance here is limited. Lawrence Halprin, *The RSVP Cycles: Creative Processes in the Human Environment* (New York: G. Braziller, 1970).
[45] Robin Evans has described twentieth-century architects' uses of sketches to resist strict measurement and thereby extend the open, uncertain aspects of the design process. James Corner has identified similarly generative tensions between measurement and immeasurability, when discussing, for example, discussions of Cartesian vs. ontological understandings of space, and the potential for the landscape architect to engage drawing's revelatory capacity. Robin Evans, "Architectural Projection," in *Architecture and its Image: Four Centuries of Architectural Representation: Works from the Collection of the Canadian Centre for Architecture,* eds. Blau, E., Kaufman, E., Evans, R., and Centre Canadien

emerging vision of site was held in many places at once: in the drawings, within the individual designer's imagination, and also among designers who were working and discussing a project together.

From this perspective, Halprin's note in the bottom-left of Figure 2.11, "relationship of pedestrian to freeway" reads not only as a comment regarding the basic layout of freeway and pedestrian corridors, but also as a reference to a series of subtle connections among the different elements of lived space. For designers, drawing through potential on-site relationships involved attending to scale, adjacencies, and juxtapositions, which in turn multiplied ad-infinitum into a much larger human/landscape condition. When accumulated, this series of "relations between" generated an extensive spatial milieu composed of living, material, and built conditions: for Halprin and his associates, this whole was greater than the sum of its parts.[46]

As they tested various freeway routes through drawing, Halprin's team also articulated their approach to freeway design in writing. In May of 1963 they detailed a series of design principles in a nineteen-page "Report on the Aesthetics of Urban Freeways."[47] The report's title matched the wording of the team's original assignment. The content, however, stretched well

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d'Architecture (Montreal: Canadian Centre for Architecture, 1989), 33-34; James Corner, "Representation and Landscape: Drawing and Making in the Landscape Medium," *Word & Image* 8.3 (1992), 243-275. James Corner, "Eidetic Operations and New Landscapes," in *Recovering Landscape: Essays in Contemporary Landscape Architecture*, ed. James Corner (New York: Princeton Architectural Press, 1999), 153-169. See also Holly A. Getch Clarke, "Land-scopic Regimes: Exploring Perspectival Representation Beyond the 'Pictorial' Project," *Landscape Journal* 24.1 (2005), 50-68.

[46] This idea was a Gestalt principle, and circulated through modernist thought as well. The Halprins had some direct exposure to Gestalt thinking, studying Gestalt Therapy (a somewhat idiosyncratic variant on more traditional Gestalt Theory) with Fritz Perls at Esalen. *Anna Halprin: Experience as Dance* (Berkeley: University of California Press, 2007), 176; Jeffrey J. Kripal, "From Emerson to Esalen: America's Religion of No Religion," *The Chronicle of Higher Education* 53.32 (2007), B6-B8.

[47] This document was not publicly circulated, but appears to have been shared with the study committee, as portions of its text would later appear in various committee documents and also in Halprin's public comments. "Report on the Aesthetics of Urban Freeways," Second Draft, May 23, 1963, 014.I.A.763-.775a, Lawrence Halprin Collection, The Architectural Archives of the University of Pennsylvania.

beyond its ostensible focus on aesthetics, towards more functional and social urban conditions. Here the team stated that the city dweller, rather than the driver, should be the primary concern in freeway design. They identified three guiding principles in this regard: condensation of the freeway to fit the density of the city, integration of the freeway with local environments, and multiplication of amenity, with freeways treated as one of many elements in a multi-faceted public space resource. Towards these ends, the team proposed that freeway designers must take into account topographic integration and exploitation, street patterns, neighborhood texture and character, relation of the freeway to land use, and local circulation factors. In essence, they argued, "The environment adjacent to and around a freeway is as important a design consideration as the freeway itself."[48]

The report's use of the term "environment" is notable here. They could have used other terms – "ecology" for example, which Halprin was already using in other writings and projects during this period. In using "environment" specifically, they deployed a word already well used in local urban design discourse, albeit with somewhat different connotations than those that the team now foregrounded. In the 1940s-50s, Bay Area based design and planning group Telesis had actively embraced the term, which, according to Telesis member Frances Violich, was not otherwise frequently used in the 1940s-50s.[49] Influenced by the British regional planning movement and encouraged by Regional Planning Association of America member Catherine Bauer Wurster, Telesis worked throughout the 1950s to develop and implement a greenbelt

[48] Ibid.

[49] Members included several renowned modernist designers, including landscape architect Garrett Eckbo and architects Frances Violich, Vernon deMars, and Geraldine Wright. According to Violich, while the "word *environment* was rarely heard at all those days," Telesis members "were given the rare opportunity to be first in clarifying and—to an extent—establishing new concepts and approaches for environmental problems." See Peter Albert Allen, "A Space for Living: Region and Nature in the Bay Area, 1939-1969" (PhD diss., University of California Berkeley, 2009), 86. Regarding earlier uses of the term by Benton MacKaye and Aldo Leopold, see Chapter One.

vision for the Bay Area.[50] Primarily interested in promoting social change through planning, they advocated "environmental design" as a socially concerned approach to improving the quality of life for urban dwellers.[51] They argued for regional greenbelt designation on aesthetic and recreational terms, and promoted environmental design as a socially focused, interdisciplinary approach to city planning.[52] This notion of environmental design became more established in the Bay Area in 1959, when William Wurster transformed the University of California Berkeley's School of Architecture into the multi-disciplinary College of Environmental Design.[53]

In highlighting the term "environment" relative to the freeway, Halprin's team both adopted the word as used by Telesis and University of California Berkeley, and expanded its definition. The existing notion of the urban environment did focus on the connections between built elements of the city, but it foregrounded interdisciplinarity and social responsibility; Halprin, instead, focused on attunement to the city's spatial, material, and lived interrelationships. Furthermore, Telesis used the term to advocate for redevelopment within

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[50] Collaborating with local conservation activist Dorothy Erskine, the women-led Marin Conservation League, the Sierra Club, and others, Telesis designers helped to establish an extensive regional open space network. Building off the 1920s state parks movement the 1930s establishment of a regional parks district in the East Bay, and a Northern California tradition of conservation that stretched back to John Muir's late nineteenth-century founding of the Sierra Club, the 1950s Bay Area conservation movement that was highly effective at protecting land at the scale of the urban region. Walker, *The Country in the City*, 130.

[51] Several Telesis members had worked on New Deal projects, primarily with the Farm Security Administration. To a degree, their concerns for social issues extended from those earlier experiences. Peter Allen, notes, however, that their urban environmentalism was far from racially equitable; it "completely ignored the creation of spaces of intense urban pollution that was entirely situated in minority neighborhoods." Allen, "A Space for Living," 92.

[52] The group's "environmental" projects involved creating coalitions across design and planning disciplines, containing sprawl, establishing greenbelts at the peripheries of cities, and redeveloping urban neighborhoods within cities. As Peter Allen puts it, Telesis advocated for "democratic collectivism around the four key elements of the human environment—housing, work, recreation and transportation. The modern architect turned planner would integrate the planning of these four elements into a complete, comprehensive environmental planning." Allen, "A Space for Living," 81.

[53] Wurster had become dean in 1950. He was friendly with the Telesis group, and his wife, planner Catherine Bauer, advocated for them and sometimes attended their meetings. Allen, "A Space for Living," 77-78, 89-90.

cities and conservation at its peripheries: thereby demarcating the city as a social sphere, and its outside as a natural one.[54] In contrast, Halprin's team imbued the city itself with natural characteristics such as dynamism and interconnectedness among diverse living elements, and they understood humans as participants in the resulting expansive, multifaceted milieu. Such understanding was articulated in detail in the report's description of neighborhood character:

> The overall character of a district refers to its dominant physical aspect when viewed as a whole. The Richmond District, for example, has an overall character of being flat to gently rolling, in addition to conveying a feeling of close enclosure almost regardless of where one is placed in the district. The bland colors and closely cropped garden vegetation tends to accentuate this character. Nowhere in the district does one find the luxuriant buoyant quality of the Lombard Street twist of Russian Hill, or the smooth elegance of the top of Nob Hill between Jones and Taylor.

This synthesis of the Richmond District's topography, plants, housing patterns, and colors was an aesthetic understanding, for it did focus on the neighborhood's appearance. Yet it also nudged the notion of aesthetics away from a strictly visual understanding of the city towards something more dynamic, emergent, and lived: a visceral sense of place defined by ongoing spatial interactions among geology, materiality, residents, and vegetation. In these ways, Halprin's team promoted a subtle shift in conceptualization, in which the urban environment took on more interrelational and holistic qualities than it had previously been assigned.

In expanding the term "environment," the Halprin team publicly articulated a set of working assumptions that he and his contemporaries used tacitly every day. This brought forward a way of thinking about the city that would soon take on even more complex meaning: in the Panhandle debates, and eventually as part of the popular environmental movement. But while the Halprin team's characterization of the urban freeway environment advanced public

[54] This was akin to Mumford's characterization of city/nature relationships, and also to the RPAA's anti-Metropolitan philosophy regarding regional design and the development of greenbelts. For more on the RPAA, see Chapter One.

discourse, it also put in motion a transformation of the team's own design approaches. The existing modernist practices through which Halprin's firm enacted and envisioned the dynamic holism of landscapes predominantly did so on spatial terms, at the scales of individual sites. They had also mostly been used in single-client circumstances, where public opinion did not impact design decisions.[55] The Halprin team's freeway statement therefore articulated an open-ended, discursive understanding of landscape that they already engaged within their own private drawing practices, but did not typically discuss publicly or show in final presentations.

Aesthetics or Environment?

In their articulation of the "freeway environment," the Halprin team did, technically, fulfill their client's request to analyze the aesthetics of the Panhandle freeway; but they did so by complicating the brief. Perhaps not surprisingly, state engineers responded to this new description of the freeway environment with some resistance. In spring of 1963, the Panhandle study team went through several drafts of the *Second Progress Report to the San Francisco Board of Supervisors*, which outlined the team's general approaches and principles regarding freeway design.[56]

In the first draft of this report, submitted by District Engineer C.F. Greene to the Panhandle study team, the influence of Halprin's earlier "Report on the Aesthetics of Urban Freeways" was clear. The draft, which appears to have been primarily composed by Greene and Halprin, placed

[55] Halprin and Associates had worked on public projects, for example the University of California Berkeley Campus. Whether or not this was the firm's first encounter with protestors on a design project, it is clear that they were surprised and disoriented by facing such a large number of highly organized, vocal, public protestors in the Panhandle case. Public activism regarding urban space was on the rise in this very moment, as evidenced by the freeway revolt movement overall.

[56] This report did not include discussion of specific routes or layouts. The first progress report was delivered on December 6, 1962. I will not discuss it here, as it was merely a three-page description of the study team's preparation and research activities to date.

environment front and center. It was divided into discussions on three major factors: "Environmental," "Engineering," and "Economics," in that order. The Environmental section opened with Webster's definition of the term environment, and went on to recount the Halprin team's discussion of condensation and integration as key principles in freeway design. This draft also noted that in its focus on issues of cost, engineering often "does not constitute a complete picture," and must be weighed against "intangible aesthetic factors"; and argued that a qualitative design approach could complement these quantitative tendencies.[57] Lastly, it emphasized Halprin's earlier argument that the freeway experiences of residents were more important than those of freeway drivers.

By the time the final version of the *Second Progress Report* was delivered to the Board of Supervisors, however, its content had shifted significantly. In the hands of state-level engineers, this version consistently supplanted discussions of "environment" with mentions of "aesthetics," and countered the first draft's concern for the study's design-based and neighborhood-oriented aspects. The previous draft's "Environmental," "Engineering," and "Economics" categories, for example, were replaced with "Engineering Study" and "Aesthetics," in that order. The document also de-prioritized the role of design relative to engineering: defining the Halprin team's work not as complementing state approaches, but as making recommendations on aesthetics. Lastly, this version reduced the importance of resident experience: in the only use of "environment" throughout the document, it was stated that Halprin would propose "treatment of the roadway and the surroundings in such a way that the overall environment would be enhanced for both

[57] "Panhandle Freeway, project file, 1962-1965," 014.I.A.2036, Lawrence Halprin Collection, The Architectural Archives of the University of Pennsylvania.

drivers and residents."[58] Rather than using the term "environment" to highlight the complexity of the urban fabric, this mention instead doubly undermined Halprin's authority in the project: simultaneously delimiting his role, and countering his stated emphasis on prioritizing residents' experiences.

Why would state highway engineers be so assiduous in constraining the environmental, design-based, and neighborhood-oriented dimensions of the Panhandle study, when the project's very feasibility was owed to editorials imagining the freeway as a network of new urban landscapes?[59] Did they suspect that the term "environment" would prompt greater opposition to freeway construction from Bay Area conservationists? Did they fear losing control over freeway design to planners and designers? Or did they revert to using "aesthetics" simply because it was a politically and professionally vetted term?[60]

In the absence of clear archival evidence, these questions remain somewhat open. Surely, however, for anyone trying to get a freeway built in the 1960s, engaging an open-ended notion of the urban environment would appear to be a sure route towards inaction. With governmental mechanisms for quantifying environmental conditions not yet invented, state engineers would have been utterly disoriented by the volume, diversity, and unquantifiability of variables than an

[58] Second Progress Report, June 10, 1963. Panhandle Freeway Revolt, San Francisco Ephemera Collection, San Francisco History Center at the San Francisco Public Library.
[59] It is, of course, possible that state engineers were simply using the language originally approved by the Board of Supervisors, hoping to contain the potentially incendiary nature of the freeway topic by adhering as closely to prior governmental agreements as possible. But this question is nonetheless worth asking, for that scenario would fit with broader disciplinary wrangling surrounding highway design during this decade. See Louis Ward Kemp, "Aesthetes and Engineers: The Occupational Ideology of Highway Design," *Technology and Culture* 27.4 (1986), 759-797.
[60] Aesthetics and beautification were relatively familiar and workable – if not always entirely comfortable – terms among highway engineers at this time, often used to denote landscape qualities. Ibid; *Aesthetics: Be Specific* (Sacramento: State of California, Dept. of Public Works, Division of Highways), 1966.

environmental model implied.[61] Designers could offer expertise in working with immeasurable qualities; yet such knowledge was so different from engineers' expertise that translation was difficult. Indeed, to some engineers, the Halprin team's ease with the qualitative dimensions of landscapes likely appeared to be equal parts nonsense and threat.[62] In this light, state highway engineers may have understood "aesthetics" as something containable and controllable, and "environment" as anything but.

In July 1963, when the Panhandle study team presented the details of the *Second Progress Report* to the Board of Supervisors, Halprin made public comments alongside other members of the team. In his presentation notes, Halprin's closing statement read: "ultimately, it is the design of the ENVIRONMENT of a freeway which counts far more than the actual structure itself."[63] The Halprin team's efforts to articulate the relational qualities of the freeway surrounds had been largely elided through the course of the progress report's editing process. In his presentation however, uncensored by state engineers, Halprin made emphatic use of an apparently all-too-potent word.

Representing Trees

The Halprin team's nascent environmental conception of freeway and city soon took a new form, in public presentations and debates regarding threatened park trees. Visually introduced in the Halprin team's drawings, this topic would then become explicit in protesters' discourse. As a concern for trees expanded throughout the Panhandle debates, it would manifest variously.

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[61] Environmental Impact Statements did not exist at this point; they would be created as part of the 1970 National Environmental Policy Act.

[62] For more on the inter-disciplinary dynamics between highway engineers and planning and design professionals during this period, see Chapter Five.

[63] "Comments by Mr. Halprin, July 9, 1963," 014.I.A.763-.775a, Lawrence Halprin Collection, The Architectural Archives of the University of Pennsylvania.

Through imagery, written word, quantitative surveys, event, and even through song, park trees would be presented as living beings with inherent value, and therefore deserving of protection.

By February 1964, the Panhandle Parkway Study group had narrowed possible freeway layouts down to a handful of options, and the Halprin team began working on illustrative drawings of those options for public presentation. The public drawings were of a different character than the process drawings discussed earlier: they were precisely crafted, with the intent to clearly and evocatively show buildable design ideas to the public. The Halprin team drew out a total of fifteen options: four choices running from Civic Center through the Panhandle, three routes through Golden Gate Park, four possible configurations along Park Presidio Boulevard from Golden Gate Park to the Presidio, and four possibilities for routing the alternative Crosstown Tunnel through the city. For each option, Division of Highways engineers provided the plan, and the Halprin team created one section and one section-perspective drawing.

Among the Halprin team's drawings, their section-perspectives were the most communicative with regards to the spatial impacts and qualities of the freeway and its environs. As a combination of two drawing types, a section-perspective combines a section's measured "slice" of information with a perspective's experiential sense of spatial depth. The Halprin team's section-perspectives thus simultaneously showed basic freeway configurations and proportions, and provided a sense of just how a freeway/park might look and feel. The team would achieve a subtle yet impactful political effect with these drawings, utilizing contradictory representational logics inherent in the conventions of perspectival landscape drawing in ways that emphasized tensions between the freeway site's structural and living elements. This was a nuanced strategy, and it is unclear how intentional it was; yet this approach was also an effective

one, with regards to tilting public Panhandle discourse towards Halprin's environmental perspective.

In order to understand this strategy, it is necessary to closely review the details of the drawing process. These drawings were created through several iterative steps.[64] In the section-perspective for Panhandle Option E-1, for example, the first draft was roughly two feet tall by five feet wide, drawn with pencil on trace paper. It would have been drawn using a drafting board and a series of design tools – T-square, triangles, scales – in order to generate precisely orthogonal lines (Figures 2.12, 2.13; see Figure 2.8 for size reference).[65] The perspectival framework would have been created by extending the edges of all the site's parallel, straight line features "back" in the drawing towards a single vanishing point – in this case, to a point towards the drawing's lower right.[66] Once the built framework was in place, non-orthogonal and non-fixed elements would be added, such as slopes, trees, building details, cars, and people.

[64] This option is the same one shown and discussed in plan diagram earlier in this chapter (Figure 2.7, then labeled option "101").

[65] It is not clear who drew this first framework. All of the designers working for Halprin would be able to do so, though some may have been assigned perspective construction more frequently due to the clarity or expediency of their drawings. This drawing would have been created by first positioning a piece of trace paper horizontally on a drawing board, affixing it to the board's surface with tape drafting dots (Figure 2.13 shows a typical drafting arrangement in Halprin's office, including the referenced tools). Then one would use a T-square and pencil to mark the drawing's horizontal line – the reference line for sectional measurements. Next, using a scale ruler and straightedge as well as the T-square, one would use a specific scale (such as 1-inch equals 20 feet) to mark along the horizontal line all the features located along the chosen cross-section of the plan. One would then use the same tools to draw all vertical changes that occurred along the cross-section. After all elements were measured and in place, one would darken the section "cut" line so that it appeared as a single continuous line.

[66] Positioning the point to the right, as done here, exposed the neighborhood-side bank of the proposed freeway option, which was composed of a series of terraced planting beds and promenades. The vertical details of built elements would be drawn with a T-square or triangle, holding it against a horizontal edge so that running the pencil along it would create vertical lines relative to the drawing's horizontals. One could either measure these vertical details by a complex process of perspectival correlation, or "eyeball" them, placing them according to the designer's practiced attunement to scale and proportion. In this drawing, the portioning of vertical elements appears to have been quite loose, as is apparent in the separations among buildings along the left side of the drawing. For more on the history and conventions

The second version of this section-perspective (Figure 2.14) was structurally simpler, but illustratively more detailed. It would have been drawn by affixing a new layer of trace paper over the first, and then copying the first drawing's framework, omitting construction lines and adding architectural detail. The landscaped terraces were imagined with greater nuance and variation as well, including a wide upper path, a bank of steps for sitting, and a gradated stepping pattern between the pedestrian and freeway zones (Figure 2.14, center). The second version therefore involved loosely designing the route's possible landscape, likely based on knowledge and ideas gleaned from sketch studies such as those discussed above.

The final perspective drawing (Figure 2.15) would have been started, yet again, by tracing the previous drawing's structural elements. Here the plantings were drawn again from scratch: in this case, by Dennis Wilkinson, who was often tasked with final landscape rendering in the office due to his ability to draw with exquisite detail.[67] According to former Halprin employee Roger Osbaldeston, when Wilkinson drew perspectives, he was known for a unique habit of starting at one corner of the page and inching his way through the drawing, gradually accumulating the image rather than outlining it with a perspectival framework. In this case, Wilkinson was working with a pre-defined, measured framework. Within that structure, however, Wilkinson could largely use a loose, aperspectival approach.

Here we arrive at the team's most decisive step with regards to activating the landscape adjacent to the freeway. Organic forms do not comply with the orthogonal logic of perspectival

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of perspectival construction in design, see Evans, "Architectural Projection"; Robin Evans, *The Projective Cast: Architecture and its Three Geometries* (MIT press, 2000), 107-121.

[67] Roger Osbaldeston, who worked in Halprin's office during this period and drew some drawings for the Panhandle project, has identified these drawings as being drawing by Dennis Wilkinson. Conversation with Roger Osbaldeston, January 31, 2015. The early 1964 project time sheets from Halprin's office support this, with Wilkinson working a large number of hours just prior to the technical report deadline. 014.I.A.4946, Lawrence Halprin Collection, The Architectural Archives of the University of Pennsylvania.

construction. When drawing trees, for example, in constructed perspective, one roughly measures their mature width and height, but otherwise draws them more loosely. Constructed landscape perspectives therefore involve an inherent tension between the drawing's geometric logic and the subject's much more complex forms. Wilkinson's drawing style amplified this tension by emphasizing the very qualities of trees that are non-orthogonal: sinuous forms, thick texture, and spatial density. The result was a heightened friction between the existing landscape and the proposed infrastructure.

In their final rendered form, then, the Panhandle section-perspectives were traditional in content, clarity, and formal approach; and yet they were also surreptitiously transgressive. On one hand, these renderings were exceedingly cautious relative to the Halprin team's written and sketched efforts to describe the freeway's urban context on environmental and lived terms. Indeed, the generative, cross-referential openness of the firm's earlier sketch drawings was in no way evident here. Instead, the team deployed well-established drawing types to present the freeway and its surrounds as a formal, bound, spatial condition, essentially presenting the roadway as a series of park-like sites. What's more, the team included no larger-scale drawings showing how the freeway would be integrated into the urban fabric at neighborhood or citywide scales. In this sense, those viewing the drawings were presented, not with a broad, holistic vision of the city, but rather, with various images of bound, parkway-like spaces.

On the other hand, however, the specific ways in which these drawings exploited perspectival convention to emphasize a tension between trees and roadway presented the freeway's landscape elements in powerful counterpoint to its structural form, and imbued the landscape with an outsized agency relative to the freeway structure. In some drawings, the freeway appeared almost insubstantial relative to the mass, lushness, and density of the

surrounding vegetation (Figure 2.16).[68] This sense was strengthened by yet more representational choices: showing the entire height of the park's tall trees, for example, demonstrated that even at this extensive infrastructural scale, the most massive figures in the freeway surrounds were trees.[69] Lastly, Wilkinson's non-perspectival technique and lush detailing also ensured that while the freeway form remained lightly specified and abstract, the site's living elements were invested with great interest and specificity. In all of these ways, Wilkinson's vegetation was not entirely dissimilar to Halprin's written "ENVIRONMENT": a transgressive depiction of powerful living complexity pushing against a delimited frame.[70]

If Wilkinson's renderings were a visual equivalent to hollering "TREES!" it seems that local protestors were watching; for the subject quickly became central in public debates that followed. On March 4, 1964, after a preliminary presentation to the San Francisco Board of Supervisors, the Panhandle study team publicly released *San Francisco Panhandle Parkway and Crosstown Tunnel: Technical Report*. This 11x17 landscape-format document briefly reviewed the history of the city's Panhandle and Tunnel route negotiations; argued for a need for urban freeways based on an anticipated increase in urban growth, local traffic congestion, and improved pedestrian safety; and described all the considered routes, explaining their positioning in the city, the character of the resulting landscape spaces, their cost, and the number of

[68] Figure 2.16 shows this better than Figure 2.15, which, as mentioned earlier, was of a scheme that offered very little room for planting.
[69] It should be noted that these trees were accurately scaled representations of mature specimens of the various species already established in the Panhandle Park. In this sense, the Halprin team essentially represented the existing, mostly mature trees in their drawings, regardless of whether they would have to be removed and replaced in some schemes.
[70] This was not the only evidence of subverted anti-Panhandle Freeway attitudes within the Halprin office; the archival project folder contains a page of the anti-Freeway petition circulating around the city at the time, signed by the members of the office. It is not clear in what spirit this was signed, but that it was signed at all suggests some renegade spirit among Halprin and his employees with regards to the project. 014.I.A.763-.775a, Lawrence Halprin Collection, The Architectural Archives of the University of Pennsylvania.

"improvements" – destroyed residences – that each route would require. Each option was described briefly in text, followed by the state-produced plan-view drawing, and the Halprin team's section and section-perspective drawings (Figures 2.17 and 2.18 show example plan and section drawings). The booklet was immediately made available for public viewing at San Francisco's City Hall and Public Library, and three public viewings of the proposed routes were scheduled, as well as two public feedback meetings: one to be held by the Division of Highways and the other by the California Highway Commission.[71]

Shortly after the documents' release, the San Francisco *Chronicle* began spurring controversy regarding the proposed routes' impacts on park trees.[72] On March 24, a *Chronicle* article quoted the Golden Gate Park Superintendent worrying that one of the options through Golden Gate Park "would ruin us. It would destroy hundreds of trees."[73] Two days later another *Chronicle* article noted that San Francisco mayor Jack Shelley "was 'surprised' to hear the Panhandle route through Golden Gate Park would require demolishing old trees... 'Digging up Golden Gate Park,' said Shelley, 'will not be well received by the people of San Francisco.'"[74] On April 1, the *Chronicle* quoted the General Manager of the San Francisco Recreation and Parks Department warning that freeway construction would destroy the park's memorial redwood grove. An April 3 *Examiner* article announced a "Save the Panhandle" rally, at which

[71] These presentations and meetings were in keeping with public procedure that the California Division of Highways had defined in 1961, in response to early freeway planning controversies such as the Embarcadero Freeway conflicts and the Supervisors' 1959 "revolt" resolution. Timeline of Events, Department of City Planning, Panhandle Freeway Revolt, San Francisco Ephemera Collection, San Francisco History Center of the San Francisco Public Library.
[72] This was not the first mention that the construction of freeways would result in lost trees – newspaper articles and inter-office correspondences had occasionally mentioned this possibility before – but prior mentions had been rare and uncontroversial. It is possible that the protection of trees had special significance for Bay Area residents, given the Sierra Club's long history and landmark 1908 conservation success in creating Muir Woods to protect a stand of Marin Redwood trees from deforestation.
[73] "How Freeways Would Ruin Park," *San Francisco Chronicle*, March 24, 1964.
[74] "Shelley Calls Summit on Freeways," *San Francisco Chronicle*, March 26, 1964.

attendees would march through the park en masse and count trees and shrubs that would be lost in various freeway configurations.[75] That same day, Halprin's team began investigating options for storing and replanting trees that might be in the path of freeway construction.[76]

On April 6, the California Division of Highways held their public hearing to solicit feedback on the Panhandle team's proposals. Procedure dictated that after this meeting, the division would recommend specific routes to the California Highways Commission for consideration. In opening, state highway engineers briefly walked the audience through the contents of the technical report, showing statistical bar graphs and pie charts regarding highway safety and anticipated Panhandle Parkway users, and the specific configurations of the routes under consideration. Then Halprin presented the various routes: highlighting advantages and disadvantages of each one, and explaining why he preferred certain routes to others. For each option Halprin addressed tree removal: carefully noting the quantities of trees and shrubs to be replanted or removed.

After a handful of statements by public officials, more than eight hours of public testimony followed. The individuals who spoke sometimes represented themselves, but more often represented neighborhood organizations, unions, or business districts. As had been the case in freeway debates overall, those who spoke in support of construction tended to reference existing traffic problems and concerns for downtown businesses, and often aligned freeways with progress and the city's economic growth. Among those who denounced the freeway proposals,

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[75] "Engineers Cast New Doubt on Pacific Heights Tunnel," *San Francisco Examiner*, April 3, 64.

[76] The office's plant expert Jean Walton contacted horticulturist Bill Heubsch to determine the cost and likely success of digging, boxing, and storing park shrubs and trees of up to twenty-inch caliper, including redwoods. This was almost certainly in awareness of recent newspaper articles, for Halprin's office kept large scrapbooks of news clippings relating to office projects. Caliper is equivalent to "diameter at breast height" (roughly 4.5 feet height): this measurement location is used for convenience and to standardize diameter measurement relative to variations in trunk flare at different ages.

some questioned the very need for a freeway through the city, and many expressed concern that residents would be displaced from the adjacent Haight-Ashbury neighborhood.

The most frequent comments on this day, however, involved the parks and their trees. Frank J. Klung, President of the Haight-Ashbury Neighborhood Council, stated, "we will not consider any plans which will destroy park areas and their trees." Mrs. David Swent, of the Sequoia Chapter of the Daughters of the American Revolution, commented that the organization had planted some park trees in 1894, and that "we hope that these trees can be saved." Mrs. James Hughes, representing the San Francisco Chapter of the Sierra Club, said, "we feel that the destruction of trees and the disruption of the park by the building of a freeway across, through or under it would affect it in such a way that it would never be the same as it is now."[77]

If the Halprin team's imagery had encouraged public discussion of trees, it also sowed doubt regarding the team's honesty. Shirley Dalrymple, an employee at the Recreation and Parks Department, said, "well I don't believe that Mr. Halprin has been telling the truth about these trees." Willie L. Brown Jr., lawyer, NAACP member, and Haight-Ashbury resident, stated, "I was amazed when I arrived this morning at all the beautiful pictures, maps, and brochures which the Division of Highways has prepared. I think you are misleading the people with the presentation that you have made."[78] Haight-Ashbury resident Susan Bierman argued, "I think [the unattractive aspects of freeway infrastructure] have been left out because aesthetically they don't fit in with the plans that you have shown for the Park Panhandle."[79]

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[77] "District IV Public Hearing on Roads IV-SF-2, 56, 223-SF, April 6, 1964," 67, 102, 93, 014.I.A.2036, Lawrence Halprin Collection, The Architectural Archives of the University of Pennsylvania.
[78] The next year Brown would begin a long career in the California State Assembly, and from 1996-2004 he would serve as mayor of San Francisco.
[79] "District IV Public Hearing on Roads," 28, 60, 82.

A week later, the State Division of Highways recommended one specific Panhandle route to the State Highway Commission.[80] Two days after that, freeway protesters held a "Save Our Park" protest in Golden Gate Park (Figure 2.19, Figure 2.20). At the event, songwriter and folk-singer Malvina Reynolds sang *Concrete Octopus*: a song written for that rally, whose recurring theme was the loss of trees. One verse went:

> That octopus grows like a science-fiction blight,
> The Bay and the Ferry Building are out of sight,
> The trees that stood for a thousand years,
> We watch them falling through our tears,
> Oh, stand by me and protect that tree
> From the freeway misery.[81]

By repeatedly and emphatically defending park trees, freeway protesters inscribed in public discourse environmental perspectives implicit in the Halprin team's drawings. They also called those very drawings into question, finding their enthusiastic portrayals of landscape too good to be true. Wilkinson's trees inspired distrust, but they also advanced discourse: protesters now formulated their arguments around an assumption that the value of trees was neither aesthetic nor recreational, but rather inherent. This "save the trees" approach had been used in Bay Area conservation for decades already; with the Panhandle protest, it was applied to planted trees within the city center.

[80] The division's recommended route through Panhandle Park was an unpleasant surprise for the Halprin team and city planners alike: both groups felt this was the least favorable option available, as it was drastically out of scale with the surrounding neighborhood. "A Record of the California Highway Commission Hearing for Routes 23, 56, and 2", May 29, 1964, Caltrans Transportation Library and History Center.

[81] "Concrete Octopus," words and lyrics by Malvina Reynolds, 1964.

'All of Us'

At the May 21 California Highway Commission (CHC) public hearing, arguments against the freeway continued to evolve. This meeting was structured like the previous one: after presentation of the technical report contents and brief statements from the Panhandle study team, the floor was opened to comments, which continued again for roughly 8 hours. This time, the Panhandle study team discussed threatened trees at length: responding to concerns voiced at the previous meeting with both hard numbers and general acknowledgements of the trees' value. In his opening presentation, Halprin listed the estimated numbers of trees disturbed for each proposed leg of the freeway, detailing which could be saved through replanting, and which would be lost.[82] He also described the variety of species included in the Panhandle Park's original, early 1900s planting.

Freeway protesters, meanwhile, traded in their earlier focus on trees for more holistic narratives of Golden Gate Park and the Panhandle area neighborhoods. Elizabeth McClintock, botanist with the California Academy of Sciences, emphasized interconnections between trees, shrubs, and wind: describing at length Golden Gate Park's strategic planting in the 1870s, from initial stabilization of the pre-existing sandy dunes, to planting trees to provide wind protection for other plants against the strong winds blowing over the parklands from the Pacific Ocean. Both McClintock and Dr. Francis Herz, of the Recreation and Parks Department, argued that

[82] The official tallies were as follows: Panhandle Park: 40 trees to be disturbed, 24 could be replanted, 16 would be lost. Golden Gate Park: 800 trees to be disturbed, 655 could be replanted, 145 would be lost. Along Park Presidio: 1,310 trees to be disturbed, 986 could be replanted, 324 would be lost. These numbers were gathered by California Academy of Sciences botanist Elizabeth McKlintock for the San Francisco Recreation and Parks Department, who requested her assistance in conducting a thorough survey (the California Academy of Sciences is located within Golden Gate Park). "A Record of the California Highway Commission Hearing for Routes 23, 56, and 2."

removing individual trees in Golden Gate Park would negatively impact adjacent vegetation due to loss of windbreaks.[83]

Another new narrative articulated associations between race, class, and displacement to identify connections between housing, public parks and civil rights.[84] Mrs. Luther Goodwin of the NAACP expressed concern that the freeway would displace roughly 4,000 middle-class apartment renters of mixed races into a housing market that offered no affordable alternatives, and noted that such displacement was especially difficult for black families, to whom very few neighborhoods were open at this time. Susan Bierman described the important civic role of the integrated playground located in Panhandle Park: "No. 1, [Haight residents] like living in an integrated area, but No. 2, a lot of people stay for the [Panhandle] park. Now the people, the children, are learning to live together… and we don't want this to change."[85]

In extension of Halprin's earlier – albeit less social – articulation of urban holism, these new characterizations of the parks and surrounding neighborhoods did not concern threatened individual groups such as trees or homes. Rather, they focused on the interconnections that made these areas function and supported their inhabitants to thrive. This was best expressed by David Jenkins, of the International Longshoremen's & Warehousemen's Union Locals 10, 6, 2, 75, and 34, many of whose members lived in the Panhandle area.[86] He stated:

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[83] "A Record of the California Highway Commission Hearing for Routes 23, 56, and 2", 77-78, 103-107.
[84] Like the counting of trees, this had been mentioned before but not yet articulated as a major issue. A March 29 *Chronicle* article by Harold Gilliam had mentioned the integration of the neighborhood, and it had briefly come up at the previous public meeting. Here, however, it was repeatedly mentioned, with new narrative clarity and factual detail. Harold Gilliam, "Battle of the Panhandle," *San Francisco Chronicle*, March 29, 1964.
[85] "A Record of the California Highway Commission Hearing for Routes 23, 56, and 2," 77-78, 103-107.
[86] The San Francisco ILWU was racially progressive at this time, and they were actively involved in the 1950s-60s in developing affordable, racially integrated housing within the city for their workers. They therefore shared a broader goal with HANC: to demonstrate that racial integration could result in successful, thriving neighborhoods. Hilary Botein, "Labor Unions and Race-Conscious Housing in the

> The great unwashed, the great majority of citizens, the great workers in this town, the longshoremen and the teamsters and the building trades who brought wages up, who made it prosperous for business, who didn't make this a "dead port," who gave San Francisco a reputation all over the world, are not going to stand still for this endless non-consulting with the people in the area, the neighbors, taking our trees away, our green areas away, tearing down our houses and all this trying to manipulate us. "It will not be 700, but 500, but 200, but 100." We say if you are going to plan, plan for all of us.[87]

Combined with other protesters' comments that day, this statement reinforced a cumulatively collective understanding of the Panhandle Parkway environs. In other neighborhoods and other circumstances, a localized protest such as this one might add up to nothing more than what we today refer to as NIMBYism: a desire on the part of self-interested residents to keep the freeway out of their personal backyards, even if that meant displacement for residents in another part of the city. In this particular case, however, two things broadened the debate. First, the Haight-Ashbury neighborhood's central role in the local civil rights movement meant that the coalition of residents coming together to fight freeway-based displacement was racially and economically diverse; this resulted in a collective argument that freeway displacement was a matter of civil rights. Second, to defend the threatened parks, protesters mobilized a notion of "nature" as a both public resource and as a force of living complexity in its own right. The unique qualities of this specific part of the city – in fact, the same things that made it a target for freeway development – made it a powerful ideological, ethical, and political force against that development.

With all of these factors in play, the case against the Panhandle Freeway grew, argument by argument, into something universal. Individual trees supported park ecosystems, parks

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Postwar Bay Area: Housing Projects of the International Longshoremens and Warehousemens Union and the United Automobile Workers," *Journal of Planning History* 15.3 (2016), 210–229.

[87] Ibid., 182

supported interracial community building, neighborhood integration offered stability to a black population already made vulnerable by displacement. Furthermore, as argued by Jenkins, those at risk in the Panhandle proposal were not merely individuals, but contributors to the very building of the city. This cumulative understanding was resonant with environmental, civil rights, and preservation movements that were developing in San Francisco, and also in other U.S. cities at the time – as such, this perspective would contribute to a series of urban movements that were rapidly developing nationwide.[88]

Over the course of the CHC hearing, resonances between the protesters' emergent urban holism and the Halprin team's urban environmentalism were apparent. Much like the Halprin team's earlier writings and speeches, freeway protesters' testimonies now linked together natural forces, trees, parks, people, and architecture into something larger.[89] Some protesters even repeated the Halprin team's design principles nearly verbatim.[90] In return, Halprin stated towards the end of the meeting that he was moved by the comments of those who spoke of the Haight-

[88] For a brief overview of the development of San Francisco's historic preservation movement during this time, see James Brook, Chris Carlsson & Nancy J. Peters, eds., *Reclaiming San Francisco: History, Politics, Culture* (City Lights, 1998), 6.

[89] It must be noted that this holistic narrative was by no means a unanimous one - there were a variety of other arguments made and positions taken at this hearing, as there had been throughout the freeway debates. Freeway supporters most commonly cited a need to ameliorate traffic congestion, and tended to associate freeways with economic growth and progress. At this meeting, some new arguments in support of the freeway emerged as well. Contractor Al Clem noted that it was entirely possible to restore the park to prior condition following construction. John McLaughlin, a gardener for the Recreation and Parks Department, noted that freeway construction would bring significant reconstruction funds to Golden Gate Park, enabling improvements that city could not otherwise afford. "A Record of the California Highway Commission Hearing for Routes 23, 56, and 2," 118, 134-151.

[90] For example, Robert Barker, leader of a multi-neighborhood Steering Committee on Transportation, argued that "the ultimate design solution is one which achieves physical integration with the social environment," and that "in the final analysis, in an urban setting, design for the environment of the freeway is more important than design of the freeway itself." Ibid., 163-164. Halprin had focused a great deal in earlier statements on the importance of integrating the freeway into the urban fabric, and had also stated, as quoted above, "the environment adjacent to and around a freeway is as important a design consideration as the freeway itself." Halprin, "Report on the Aesthetics of Urban Freeways."

Ashbury neighborhood's integration and much-needed housing stock.[91] Despite their different positions in the debate, Halprin and the protesters clearly shared some perspectives.

The designer and protesters retained differences as well, primarily regarding questions of expertise, agency, and participation. One of these involved the preciousness of park trees. Halprin disagreed with protesters' suggestions that the lives of trees held intrinsic value; as a landscape architect, he was accustomed to building new landscapes, which required tree planting and removal both. In this vein, at the CHC meeting he described Golden Gate Park: "this was a man made park and what man made he can make again. And therefore I have a different attitude, I must confess, than my poor conservationist friends with whom I am very close with who feel that no tree at all should ever be touched."[92] While freeway protestors argued for urban conservation, Halprin's professional perspective inclined him towards seeing trees as elements in a process of cultivation.[93]

Another point of conflict involved the legibility and clarity of the freeway drawings, and, by extension, the role of skilled drawing within design process. As in the previous hearing, several residents expressed concern that the drawings in the Panhandle Parkway technical report did not sufficiently explain the proposals. Harold Korf of the Arguello Park Community commented that "we could not really see adequately the three-dimensional effect of the freeway upon our neighborhood." According to Dr. Francis Herz, "we can see lines on the map and it is

[91] "A Record of the California Highway Commission Hearing for Routes 23, 56, and 2," 280-281.
[92] Ibid., 281.
[93] This attitude separated the designer's cultivation-oriented approach to landscapes from the non-professional attitude that saw trees as natural entities, regardless of location or human involvement in their planting. Halprin's attitude regarding urban trees also represented a professional weakness of sorts: it limited his ability to conceive of trees as having inherent value, and inclined him against a preservation-oriented approach to urban sites, and towards an assumption that intervention would provide the best solution.

hard to visualize just exactly what the outcome will be, where the onramps and offramps, the cloverleafs are going."[94]

Similar issues had been raised before. But in the context of this meeting's focus on a holistic understanding of the city, such illegibility carried new implications. From the Halprin team's perspective, the final presentation drawings represented an extensive design process whose drawing practices supported synergistic understandings of lived space. The team had drawn their plans and sections at massive scales, so that they could understand their details intimately. They had skillfully used a range of drawing techniques to attune to the relational dimensions of freeway-adjacent spaces. They had chosen to draw section-perspectives, thereby highlighting the site's characteristics in ways that emphasized qualitative aspects of site. They masterfully exploited drawing conventions in ways that foregrounded the importance of park trees in the urban context. All of these choices resonated with protesters' emergent depictions of the urban environment as something multiply interactive and lived.

And yet, in this exceedingly complicated and high-stakes public project, those techniques and methods were failing in a basic way. They were private in nature, and therefore invisible to protestors; as a result, they failed to visually demonstrate the full complexity of the freeway environment that the team had so thoughtfully invoked in their design process and articulated in writing. The Halprin team had drawn interrelated plans, sections, and perspectives as a means to develop *their own* understanding of the site, and to cultivate *their own* roles as skilled mediators and cultivators of its potential. At the same time, when it came time to present their findings, they had created a fairly traditional set of drawings: despite some subversive qualities, they were spatial rather than networked at the urban scale, presentational rather than discursive. The trees

[94] Ibid., 219, 187, 81.

were exquisitely rendered, yes, but rendered they were. In this way the team's private, expert practices of engaging with the urban environment had resulted in drawings whose viewers felt confused, manipulated, and excluded from the decision-making process.

Halprin would reflect on this issue several years later, describing how the Panhandle project incited his interest in participatory design processes:

> In our own work in various communities we found that no matter how good or well-proposed our designs were, they were challenged by some people because they were not involved in, or accountable for, the basic premises of these designs. We had to face difficult confrontations when we tried as skillfully and sensitively as we could to design a freeway in San Francisco. We had evolved some very advanced solutions which were heralded in all the professional magazines as breakthroughs in urban design. But the citizens of San Francisco refused to allow them to be built – in large measure, we believe, because the decision to build had been thrust upon them. They resisted decisions which were made for them and revolted against all freeways.[95]

The Panhandle Parkway study catalyzed debate over what the city was, and who had agency in its transformation. Seeking to keep San Francisco's future out of the hands of the state, local protesters recast the city as a threatened environment in which the residents were both protectors and participants. In this sense, they characterized the urban environment as something more collective than operative: accumulated through small everyday actions and experiences, rather than masterminded as a functional system.[96] In contradiction to that collective, public model, the Halprin team's drawing method achieved a sense of environmental agency only for

[95] Overall, it appears that Halprin recognized the issue of participation at play here. And yet his wording falls short of recognizing the problematic role of his team's design approach itself - for the problem in this instance was not only the "premise" of the designs or the "decision to build," but also the relatively isolated way in which those premises and decisions were tested and explored. Lawrence Halprin and Jim Burns, *Taking Part: A Workshop Approach to Collective Creativity* (The MIT Press, 1974), 12-13.

[96] In resonance with this understanding of the freeway protesters' emergent urban environmental collectivism, Greg Castillo has recently described how in the 1960s "Berkeley – university and city – [was] a laboratory for design experiments that sought to recalibrate everyday urban environments in the service of ecological well-being," in which activists and communards "sought to connect the values of ecology with the broader agenda of social transformation." Greg Castillo, "Hippie Modernism," *Places Journal* (2015), https://doi.org/10.22269/151026.

those who participated in the skilled actions of designing. The team's expertise was problematic here precisely because it was practiced privately; without having access to the deeper logic of the designers' approach, locals remained unconvinced of the value of their proposal.

Nonetheless, in the midst of this overt failure to persuade, Halprin and his team did succeed in supporting a new conceptualization of the city as a living, interrelational, holistic environment. This was a success that they may not have anticipated, intended, or even fully perceived, as it was connected to practices and perspectives inherent to their profession's expertise and ethics. Halprin and Associates failed to build a freeway landscape. They did, however, participate in dialogue with local residents to craft a new way of seeing and engaging the city. They contributed, through a messy, iterative, discursive public process, to enacting the city as an urban environment, "a great functioning whole."

Conclusion: Impacts of an Unbuilt Project

After the May CHC meeting the Panhandle Parkway debates would continue for several months longer, though the involvement of Halprin and Associates would be minimal. By request of the Board of Supervisors, San Francisco's departments of City Planning, Public Works, and Recreation and Parks would continue working together to test routes other than those endorsed by the Division of Highways, with the goal of minimizing neighborhood and park interference to the greatest degree possible. This involved yet more tallying of potential tree and home loss, for schemes that had not previously been evaluated on those terms. In mid-July, the three departments officially endorsed two routes, both of which were modified versions of options studied earlier: a divided highway along the edges of the Panhandle Park, and a cut-and-cover

tunnel through the Northeastern edge of Golden Gate Park.[97] At that point, the final decision regarding the freeway's fate was in the hands of the Board of Supervisors, many of whom had opposed the proposal from its inception. In October, the San Francisco Board of Supervisors voted down the remaining proposals for the Panhandle Parkway. Meanwhile, local resistance to state freeway plans was rapidly spreading throughout the state.[98]

The death of the Panhandle Parkway idea was not quite the end of freeway planning for San Francisco. In 1966, the city and state would attempt freeway planning once more, this time jointly funding a multi-volume citywide freeway study that weighted housing and urban design ramifications equally with traffic needs and construction costs, and that incorporated mass transit considerations into the freeway planning process.[99] This plan, however, would meet the same fate as the Panhandle Parkway proposal. After that the city would see more freeway demolition than construction: the Embarcadero Freeway would be dismantled in 1989, and the city's Central Freeway would be demolished between 1992 and 2003 (Figure 2.21).[100]

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[97] This latter route would, by the Recreation and Parks Department's estimation, enable the redesign of a previously "unimproved" portion of Golden Gate Park – the only portion of live oak scrubland that remained from before its 1870's development. One editorial appeared during this period arguing that the woodland should be just as cherished as the park's planted areas; but otherwise no concerns were raised regarding its protection. That the oaks were not considered worth protecting arguably illustrates just how nascent urban environmental conservation approaches were in the 1960s; by today's standards, it is surprising that an old-growth native woodland would not be deemed worthy of conservation. Ann Purdy M.D., "The Case Against a Freeway in Golden Gate Park," *San Francisco Chronicle*, July 29, 1964.

[98] Journalist Harold Gilliam summarized the growth of this statewide movement in "A Critical Report on Freeways," *San Francisco Chronicle*, October 14, 1964.

[99] The proposed Bay Area Rapid Transit system occasionally came up in arguments against the Panhandle freeway. The city's 1948 freeway system proposal had not been determined with mass transit in mind. Some argued that in light of emerging mass transit plans, existing freeway plans should be jettisoned and a new more comprehensive transportation plan should be developed. "A Report to the San Francisco Board of Supervisors on the Panhandle and Golden Gate Freeways: A Joint City- State Study" (1966), Freeway Revolts, San Francisco Ephemera Collection, San Francisco History Center of the San Francisco Public Library.

[100] Today the city's freeway footprint is a shadow of original plans (Figure 2.21, compare to Figure 2.1). The Panhandle and Golden Gate parks retain their pre-freeway traffic patterns, with the exception of one

After the Panhandle project, Halprin continued to investigate freeway design and urban transportation networks. From 1964-66, he participated in a series of design studies for the proposed Bay Area Rapid Transit system. In 1966, he further developed the firm's freeway design principles in the book *Freeways*. In 1967-68, he participated in a national design advisory board, producing best practice guidelines for urban freeway design in *The Freeway in the City*.[101] From 1970-1976, his firm designed Seattle's then innovative (and later controversially dangerous) Freeway Park, whose configurations built on the spatial, multi-tiered approach imagined in the Panhandle drawings.[102]

In other ways, however, the Panhandle study represented a waning approach for Halprin's firm. Though it was not evident in the Panhandle freeway drawings, Halprin's techniques and methods were rapidly transforming in the early-mid 1960s. He started experimenting with techniques for showing movement, change, and interaction in the early 1960s, incorporating cybernetics derived notions of "chance" into sketching practices and into dance scores for Anna (Figure 2.22).[103] With these experiments, his previously private, spatial modernist design approaches and his notion of the designer's role within larger systems began to expand towards more indeterminate, open, and collective techniques for engaging interconnections between

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particular increase in commuter traffic: the Panhandle is now a heavily-used east-west spine in the city's network of bike lanes.

[101] The work of this advisory board is the subject of Chapter Five.

[102] The design of Freeway Park was actually led by Angela Danadjieva, who joined the firm in 1967. For an account of the design of Seattle Freeway Park, see Alison Bick Hirsch, "Lawrence Halprin: Choreographing Urban Experience" (PhD diss., University of Pennsylvania, 2008), 180-197. Regarding more recent controversy regarding violent incidents in the park, see Charles Mudede, "Topography of Terror," *The Stranger*, August 22, 2002.

[103] Chance was a cybernetic concept, as filtered through artists such as John Cage and Merce Cunningham (see Chapter One). Anna Halprin was exposed to open scoring through several sources: she knew Cunningham, occasionally worked with Judson dancers, and collaborated with Cage's former student La Monte Young. She also shared studio space and sometimes collaborated with members of the San Francisco Tape Music Center, a collective of musicians who explored the sound-making capacity of new technologies. Ross, *Anna Halprin*, 146–152.

humans and natural forces. By the mid-1960s, his firm began engaging such representational explorations as part of the design process. In residential development projects such as Peacock Gap (1964-65) (Figure 2.23) and Sea Ranch (1963-67), they mapped existing plant communities, geological patterns, tidal flux, and meteorological flows across the site, and then developed designs that explicitly responded to those phenomena. In other projects, they developed participatory design processes: events through which those attending could explore the site to be designed and creatively imagine its future.[104] Emergent design approaches such as these were resonant with Panhandle protesters' community-oriented notions of environment: they documented ephemeral flows, made transparent the designers' own roles in the design process, and created new ways for non-designers to participate in design decision-making.

What, ultimately, should we take away from the Panhandle Parkway's history? Given its unending local/state controversies, zeitgeist-deaf engineers, not quite innovative drawing techniques, and thoroughly unbuilt outcome, one may be inclined to view the Panhandle project as a failure, or at best a non-event. And yet viewed from another perspective, the Panhandle Parkway was a site of significant transformation. It catalyzed popular understanding of the city as a complex community: one whose alliances coalesced across boundaries, not only of race and class, but also of spatial, material, and species divides. Previously nascent in the city's cultural and aesthetic norms, this Bay Area breed of environmentalism tested and made more explicit through the Panhandle debates.[105]

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[104] In this way, Halprin's community-related work would move him even further away from earlier modernist regionalist approaches, especially with regards to making designing a shared, even public act; although it should also be acknowledged that Halprin's inclusiveness was also far from perfect Alison Bick Hirsch, "Scoring the Participatory City: Lawrence (& Anna) Halprin's Take Part Process," *Journal of Architectural Education* 64.2 (2011), 127-140.

[105] Greg Castillo has detailed how Bay Area environmentalism extended beyond Northern California in the late 1960s, to influence discussions of ecological design, and also the popular environmental

As conditioned by these debates, the Halprin team's definition of the term "environment" would serve as a hinge between earlier regionalist conservation efforts and a nascent popular environmentalism. In bringing a new conception of the "environment" into use relative to freeway planning and design, Halprin and the Panhandle protesters participated in the idea's broader transformation, propagating a way of thinking about humans, cities, and ecologies that would develop greater significance in the years to come. As freeway controversies and revolts multiplied and entwined with social, environmental, preservation, and civil rights movements and across the nation in the 1960s, the issues, questions, and potentials explored in the Panhandle controversy would reverberate along with them: in a series of public, disciplinary, and governmental experiments and debates regarding the environments of freeways and the potentials of ecological design. Tensions regarding aesthetic versus environmental understandings of built landscapes, cultivation versus conservation models for environments, and community versus systematic understandings of a living whole would continue to circulate as well: throughout freeway controversies, and into the growing environmental movement.

This project also demonstrated that certain modernist eco-centric approaches needed testing and revision in order to effectively engage the large scale of the city, and the demands of public process. This issue catalyzed Halprin's own innovations, and would prompt other designers to experiment with new techniques and methods in the coming years as well. Among designers, freeways would increasingly become sites of representational experimentation. The sheer magnitude of a freeway simultaneously enabled and stretched spatial awareness: prompting designers to envision interrelational dynamics at a wide range of scales, and to demonstrate

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movement. Castillo, "Hippie Modernism." See also Kenneth Brower's description of Berkeley as "epicenter for American environmental radicalism." Kenneth Brower, "Radical Roots: Finding Environmentalism Amid the Schisms of mid-'60s Berkeley," *California Magazine* (Fall 2014).

publicly just how the resulting environments would function, look and feel. As was apparent in the Panhandle study, this confrontation of scales pushed modernist landscape drawing techniques to their limits, challenging conventional uses of plan, section, and perspective that depicted experience as something centered around the relatively small human body. Even though designers could rely on their skilled expertise to understand this complicated condition, communicating such complexity to the public was another matter altogether.

Freeways were not merely matters of spatial experience. They were also networked complexes spanning the entire city and linked into a nationwide system; massive infrastructures that caused noise, smells, and pollution and whose construction put large numbers of people and other living beings at risk; long, slow projects whose planning involved complicated bureaucratic maneuvering and whose construction could take decades. In reckoning with this 'new nature' of sorts, designers such as Halprin would find themselves sometimes at a loss regarding just how to communicate this novel condition to residents, who for their part would increasingly embrace roles not as mere viewers, but as inhabitants of the city: with environmental rights, and the political power to protect them.

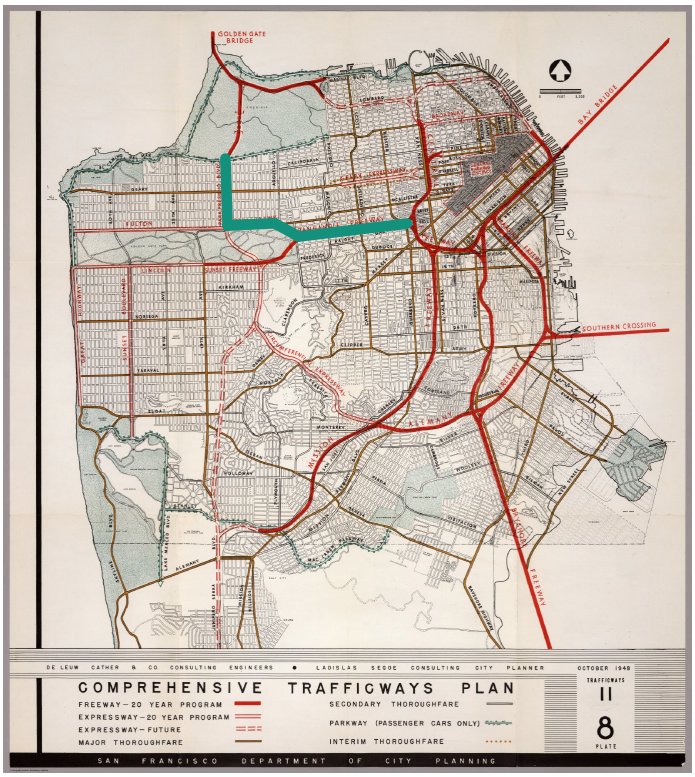

Figure 2.1. The 1948 Trafficways Plan for San Francisco, by the San Francisco Department of City Planning with De Leuw Cather & Co, Consulting Engineers, and Ladislas Segoe, Consulting City Planner. The Panhandle Freeway is marked by a thick green line (author's addition). San Francisco Ephemera Collection, San Francisco History Center of the San Francisco Public Library.

Figure 2.2. Aerial photograph of the Embarcadero Freeway between the waterfront and downtown, 1960s. The city's Ferry Building is along the waterfront (the building's tower can be seen immediately to the right of the freeway). FoundSF, http://foundsf.org/index.php?title=Freeways_Never_Built,_or_Unbuilt_after_1989_quake (Accessed November 26, 2017).

Figure 2.3. Halprin and Associates' office, 1960s. "Photographs LHA Staff and Contact Prints," Lawrence Halprin Collection, The Architectural Archives of the University of Pennsylvania.

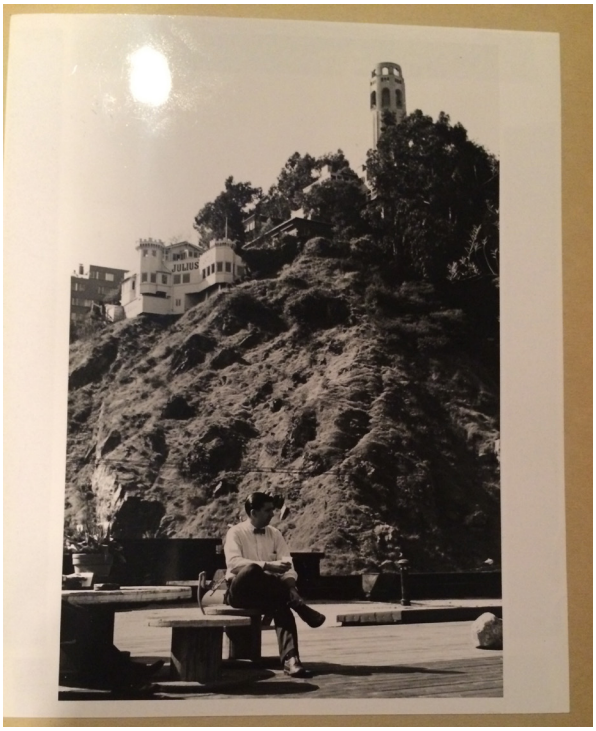

Figure 2.4. Halprin and Associates' outdoor rooftop deck, 1960s, with Telegraph Hill and Coit Tower directly beyond. "Photographs LHA Staff and Contact Prints," Lawrence Halprin Collection, The Architectural Archives of the University of Pennsylvania.

Figure 2.5. Dancers in Anna Halprin's improvisational work, 1962. Janice Ross, *Anna Halprin: Experience as Dance* (University of California Press, 2007).

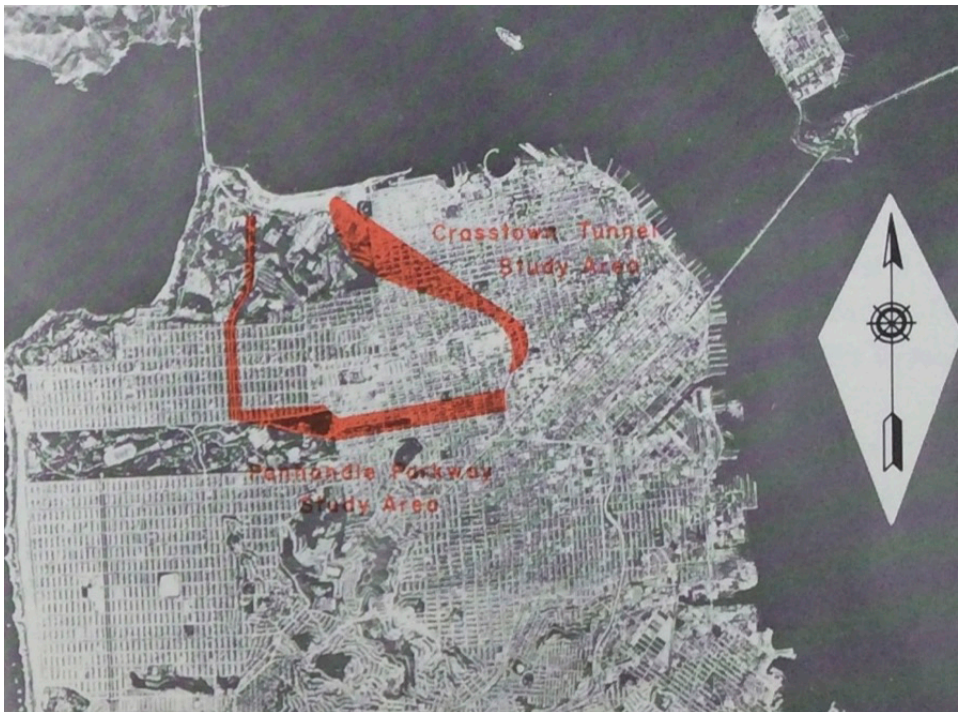

Figure 2.6. Diagram showing the routes under consideration in the Panhandle and Crosstown Tunnel study. 014.I.A.763-.775a, Lawrence Halprin Collection, The Architectural Archives of the University of Pennsylvania.

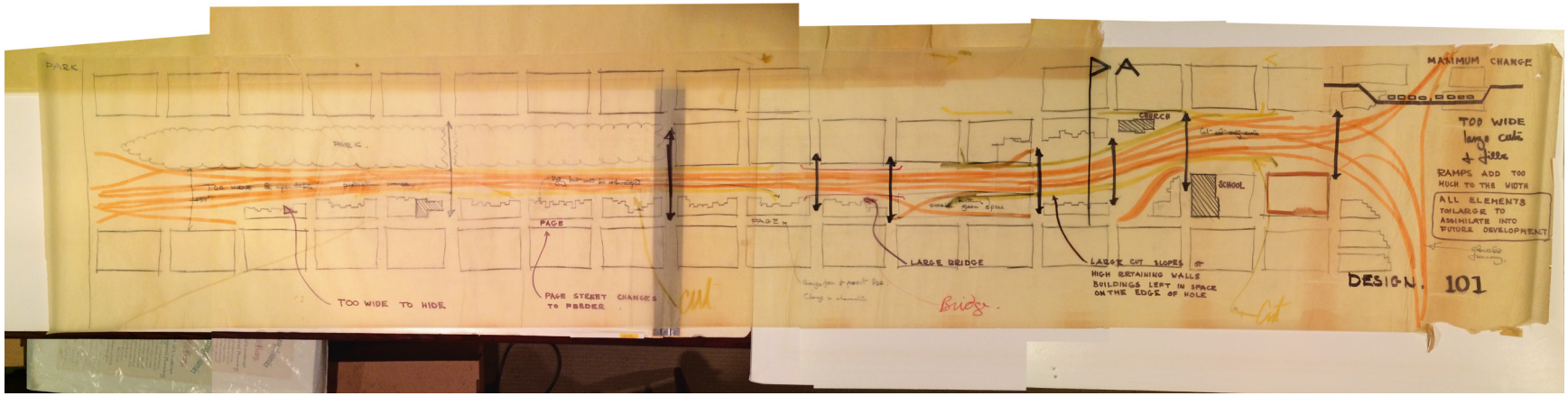

Figure 2.7. The Halprin team's plan diagram analyzing route option 101 for the Panhandle Parkway. Shown here: the portion of freeway from the eastern edge of Golden Gate Park (left edge) through Panhandle Park, to Civic Center (on the right). Note section diagram in upper-right corner. Panhandle Freeway Drawings, Lawrence Halprin Collection, The Architectural Archives of the University of Pennsylvania.

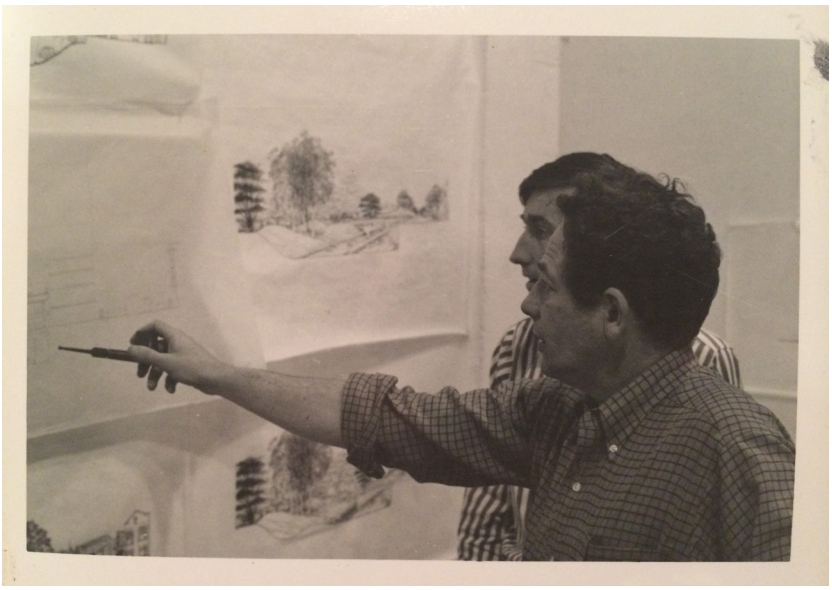

Figure 2.8. Lawrence Halprin (front) and John Evans discussing Panhandle Parkway drawings. "Photographs LHA Staff and Contact Prints," Lawrence Halprin Collection, The Architectural Archives of the University of Pennsylvania.

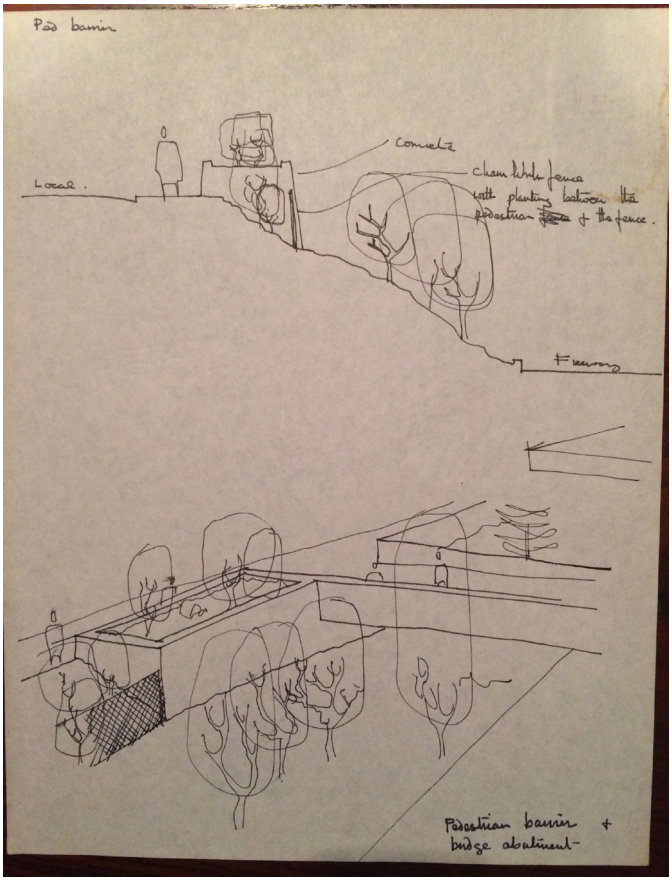

Figure 2.9. Sketches by Lawrence Halprin of a portion of a proposed Panhandle Parkway design: section (above) and bird's-eye view (below). 014.I.A.763-.775a, Lawrence Halprin Collection, The Architectural Archives of the University of Pennsylvania.

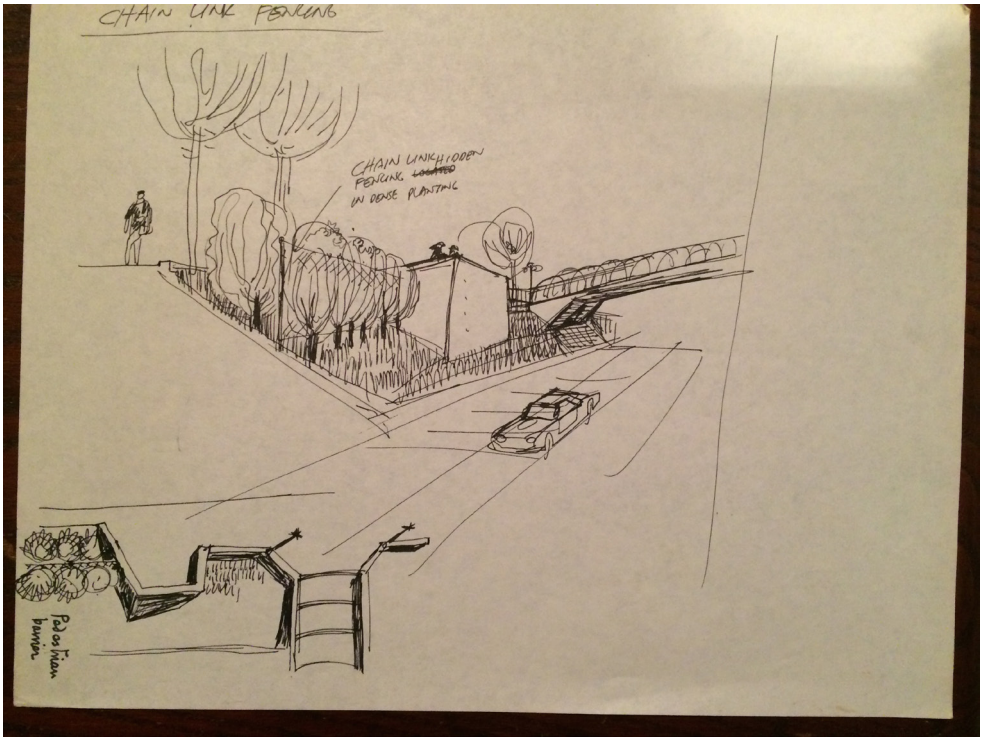

Figure 2.10. Sketches, likely by John Evans, of a portion of a proposed Panhandle Parkway design: perspective (above) and plan (below). 014.I.A.763-.775a, Lawrence Halprin Collection, The Architectural Archives of the University of Pennsylvania.

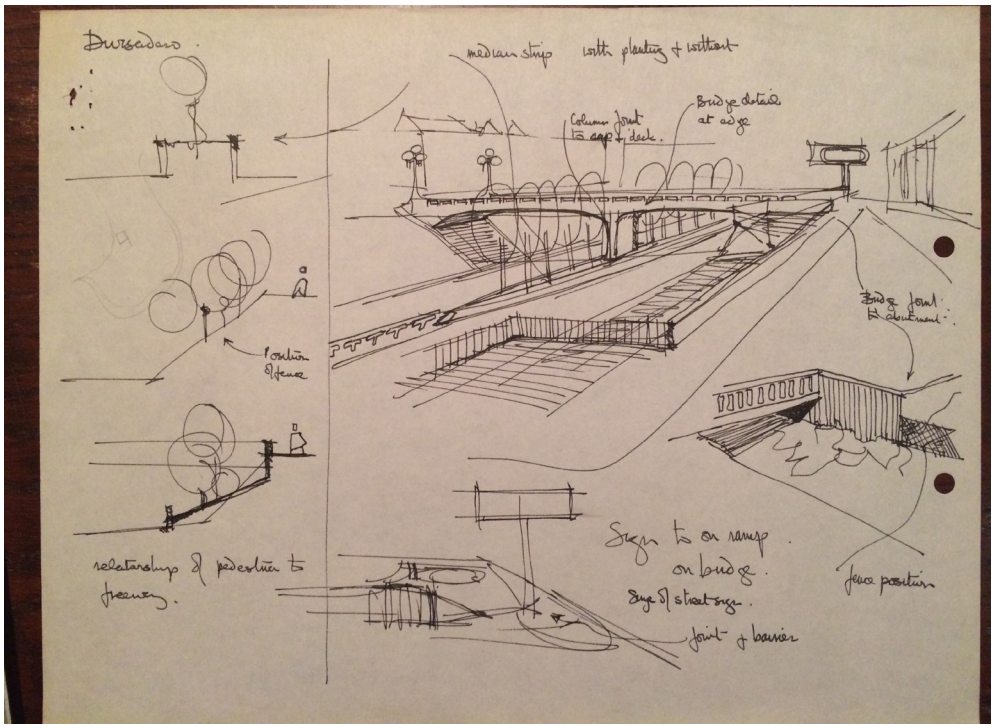

Figure 2.11. Sketches by Lawrence Halprin of a portion of a proposed Panhandle Parkway design. Note comment at lower left: "relationship of pedestrian to freeway." 014.I.A.763-.775a, Lawrence Halprin Collection, The Architectural Archives of the University of Pennsylvania.

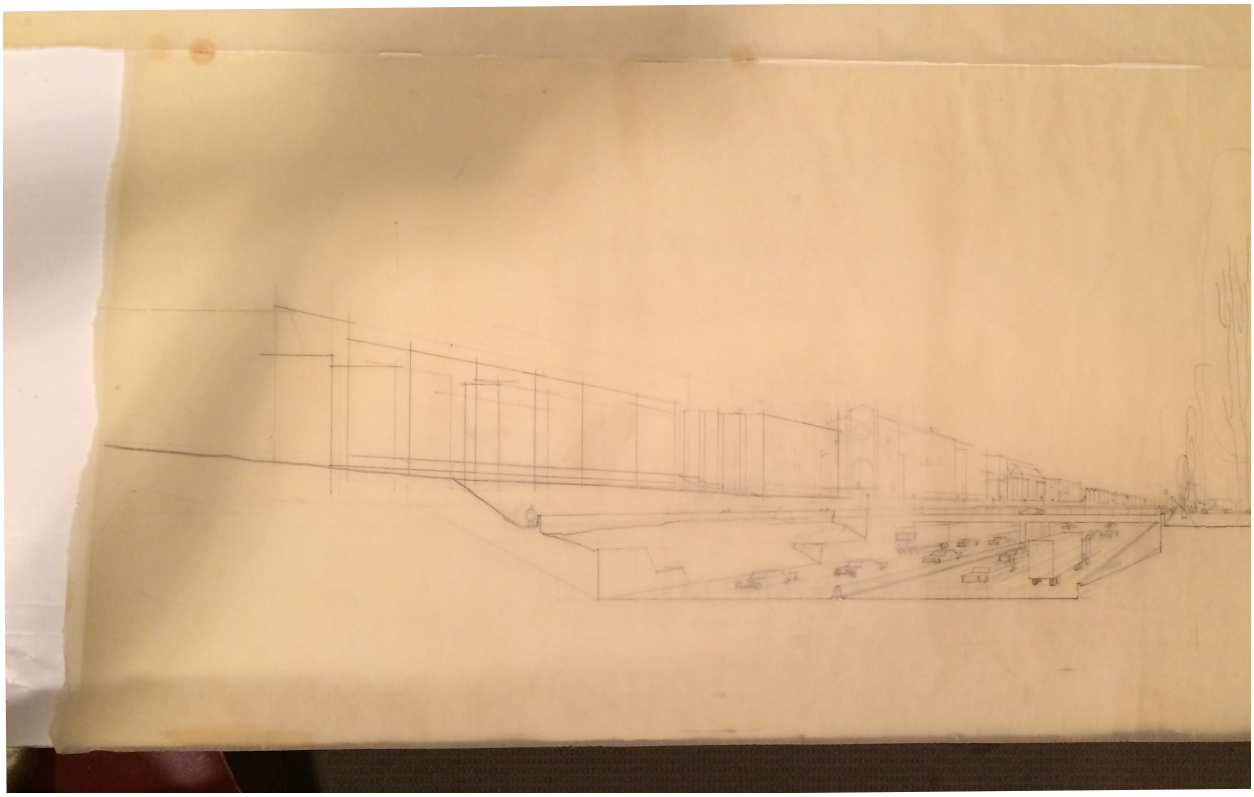

Figure 2.12. Section-perspective framework for a final drawing of one of the proposed Panhandle Parkway route options. Panhandle Park is to the right, neighborhood residences are to the left. Panhandle Freeway Drawings, Lawrence Halprin Collection, The Architectural Archives of the University of Pennsylvania.

Figure 2.13. A designer at Halprin's office using t-square and triangle to draw the measured elements of what is probably a section drawing. "Photographs LHA Staff and Contact Prints," Lawrence Halprin Collection, The Architectural Archives of the University of Pennsylvania.

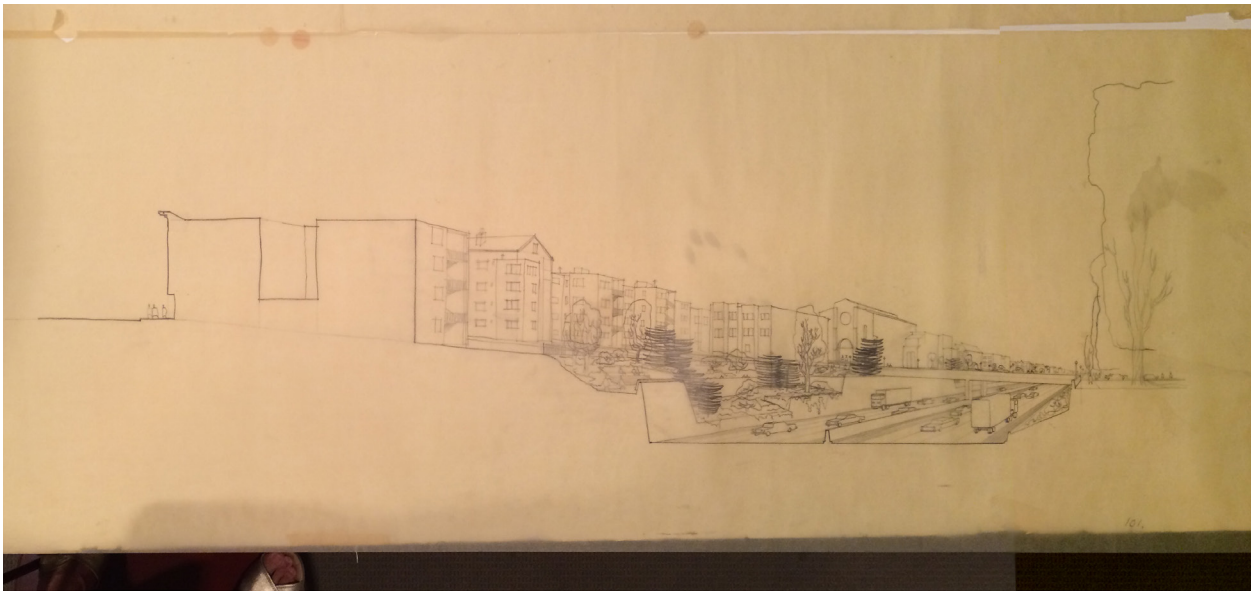

Figure 2.14. Refined section-perspective for a final drawing of one of the proposed Panhandle Parkway route options. Note detailing in the landscaped walls between residences and freeway. Panhandle Freeway Drawings, Lawrence Halprin Collection, The Architectural Archives of the University of Pennsylvania.

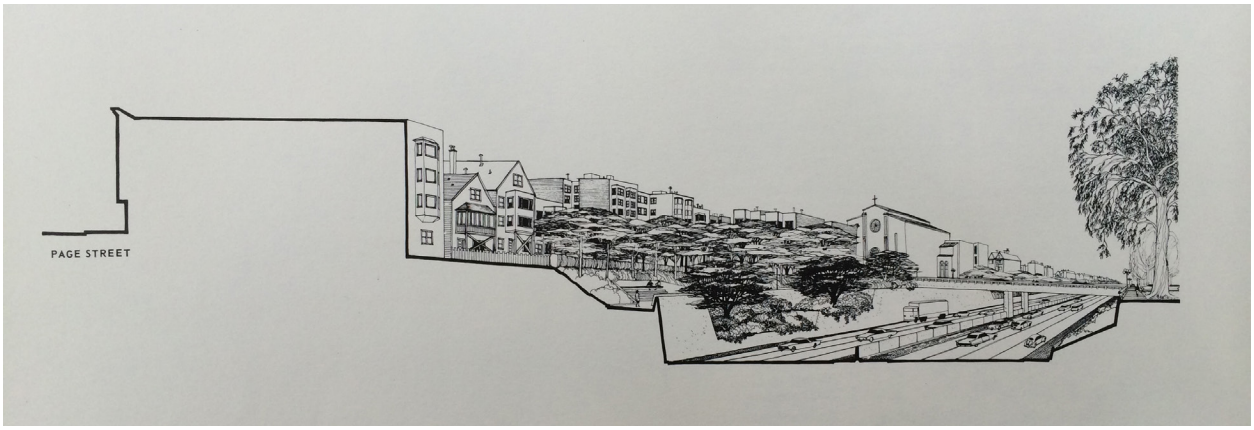

Figure 2.15. Final presented section-perspective of one of the proposed Panhandle Parkway route options. *San Francisco Panhandle Parkway and Crosstown Tunnel: Technical Report,* California Division of Highways, March 1964, 27. San Francisco Public Library.

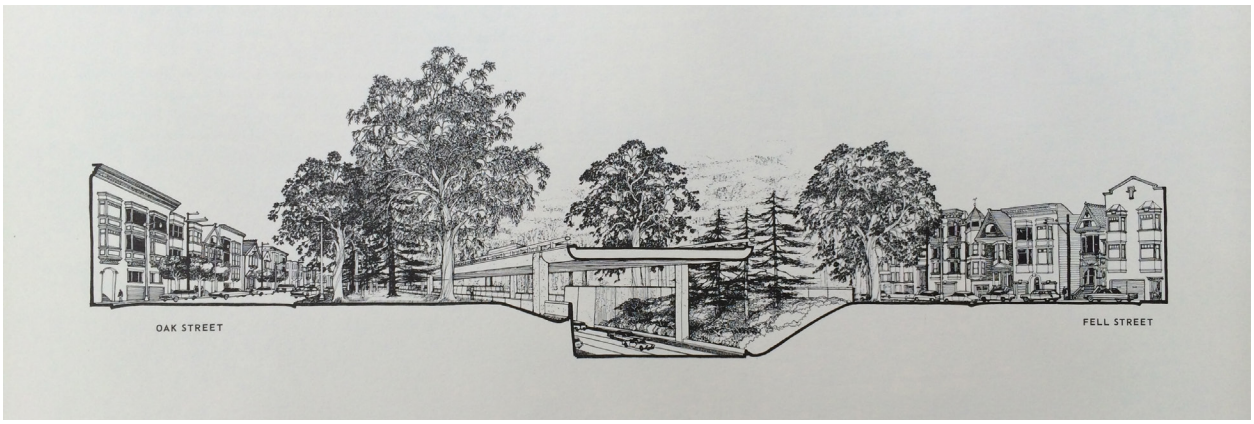

Figure 2.16. Final presented section-perspective of one of the proposed Panhandle Parkway route options. Note the lightness of the freeway structure and the detail and density of the trees. *San Francisco Panhandle Parkway and Crosstown Tunnel: Technical Report,* California Division of Highways, March 1964, 39. San Francisco Public Library.

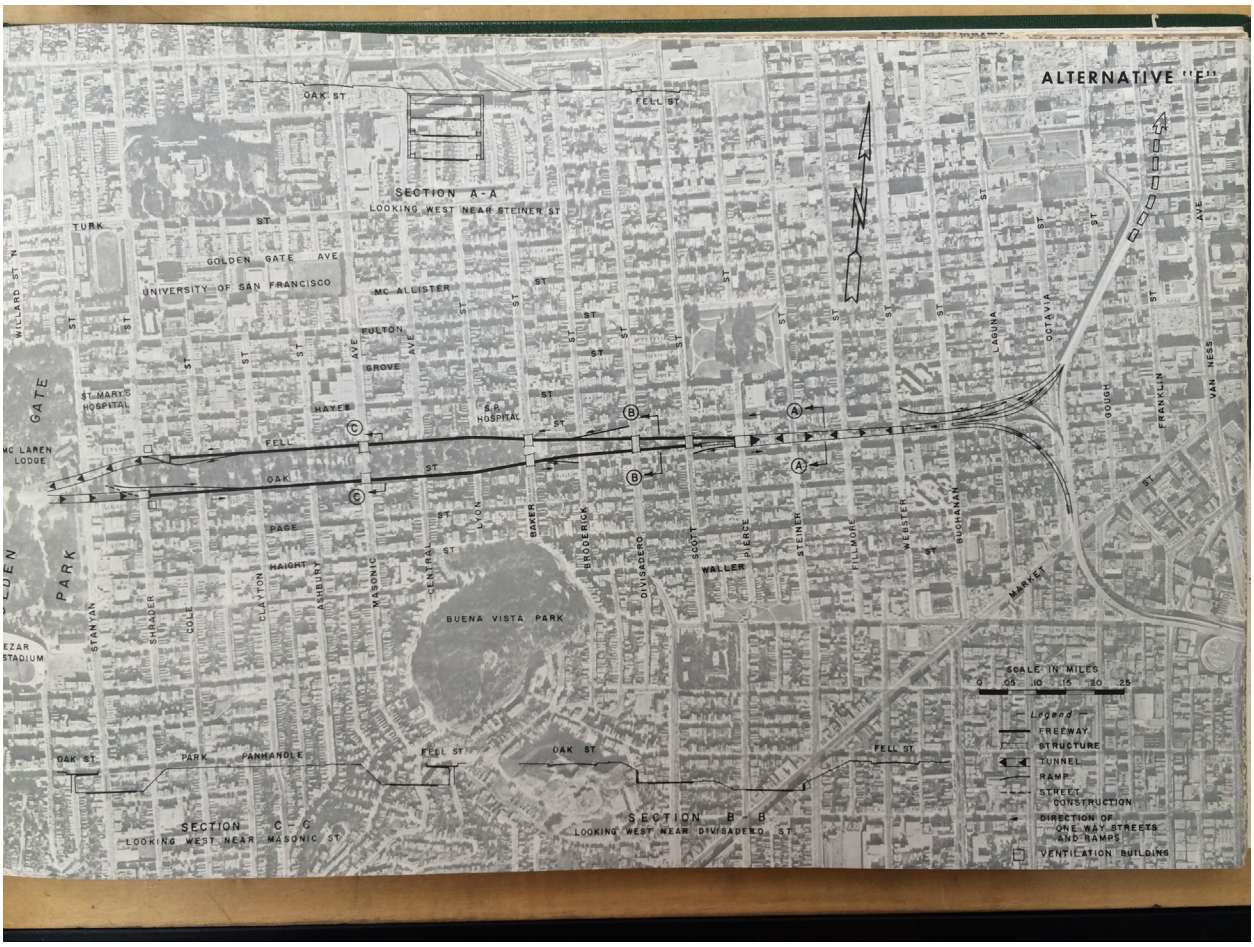

Figure 2.17. Final presented plan view of one of the proposed Panhandle Parkway route options. *San Francisco Panhandle Parkway and Crosstown Tunnel: Technical Report,* California Division of Highways, March 1964, 33. San Francisco Public Library.

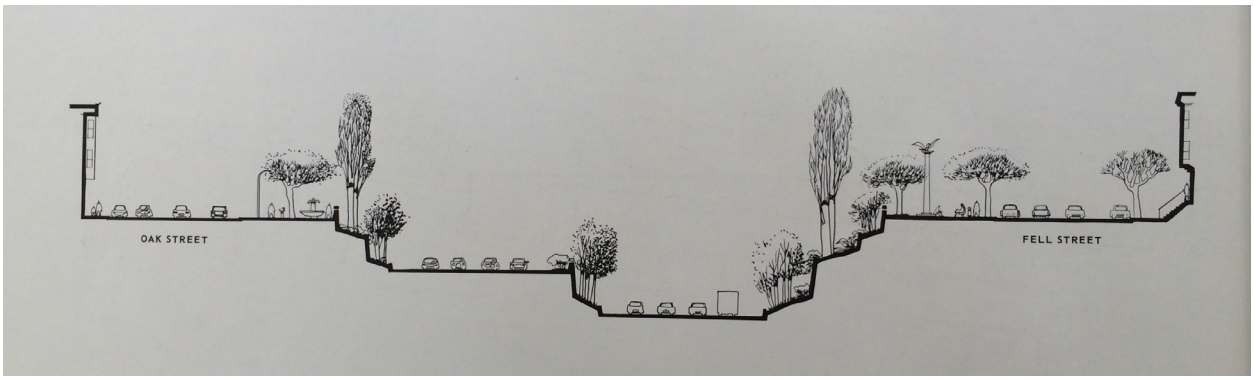

Figure 2.18. Final presented section view of one of the proposed Panhandle Parkway route options. *San Francisco Panhandle Parkway and Crosstown Tunnel: Technical Report,* California Division of Highways, March 1964, 34. San Francisco Public Library.

'Committee of 100,000'

S.F. Progress May 13-14, 1964 P.1,C.4

Sunday set for giant 'Save the Park' rally

Special to The Progress

The largest grass-roots civic gathering in San Francisco history—with upwards of 100,000 expected—is scheduled for this Sunday, May 17, in the Golden Gate Park Polo Grounds.

The mammoth rally will protest plans by the State Division of Highways to route a freeway through part of Golden Gate Park.

Starting time is 2:30 p.m.

The rally is sponsored by the Citizens Committee to Save Golden Gate Park, which is composed of representatives of 26 San Francisco civic and neighborhood groups.

The committee represents a united front of merchants groups, neighborhood associations and individuals who oppose the proposed "Panhandle Freeway" into Golden Gate Park.

The theme of the rally is "an old-fashioned day in the park." Entertainment will be provided by a 50-voice chorus, several bands and soloists. Parents are urged to bring their children.

The Municipal Railway will schedule special runs to the Polo Grounds Sunday afternoon to handle the crowd.

Robert Barker of the Haight-Ashbury Neighborhood Council, logistics chairman for the rally, yesterday urged all people planning to attend to park their cars outside the park on either the Sunset or Richmond sides and walk into the Polo Grounds.

The Board of Supervisors on Monday, May 18, is expected to take a stand on the controversial proposal to run a freeway along the Panhandle, burrowing under Golden Gate Park and out Park Presidio Blvd. to the Golden Gate Bridge.

The $122 million freeway would wipe out over $2.5 million in homes and other property along the route.

The State Division of Highways has stated that Golden Gate Park would "not be harmed" by the construction, but state engineers have been unable to satisfy Recreation and Park Department officials on this point.

Superintendent of parks Frank Foehr, after huddling with highway engineers last week, said that they had failed to convince him that the freeway would not cut off large areas of the park to public use.

The Recreation and Park Commission went on record several years ago as being opposed to any freeways in park lands.

Proponents of the freeway claim that it would not hurt the park. Some say that the freeway would make the park a little better place than it is now.

But park officials, scientists and others will full knowledge of the state's plans are positively horrified at the proposal.

Dr. Elizabeth McClintock of the California Academy of Sciences said last week that the proposed "cut and cover" freeway tunnel through the main portion of the park would reap untold damage.

Rather than "not affecting the park," the digging for the tunnel would destroy hundreds of trees and endanger many hundreds more, Dr. McClintock said.

The tunnel would mean a ditch 50 feet deep and twice as wide as the present Main Drive through the park from Mc[illegible]

Majestic trees shade youngsters who stand in the path of what one day may be another freeway.

Progress photo by Pirkle Jones

Figure 2.19. Announcement of pending rally against the Panhandle Parkway. "Sunday Set for Giant 'Save the Park' Rally," *San Francisco Progress*, May 13-14, 1964. San Francisco Ephemera Collection, San Francisco History Center of the San Francisco Public Library.

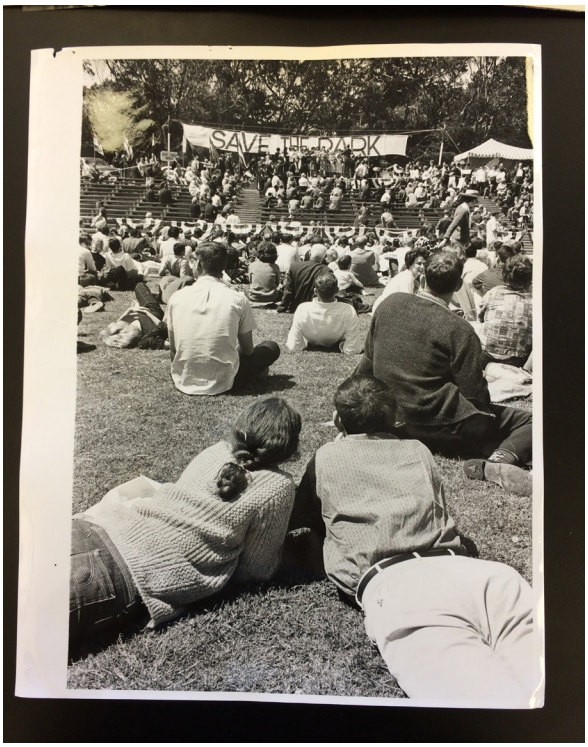

Figure 2.20. Protesters at 'Save the Park' rally, May 17, 1964. San Francisco Examiner Photograph Collection, Bancroft Library Special Collections, University of California Berkeley.

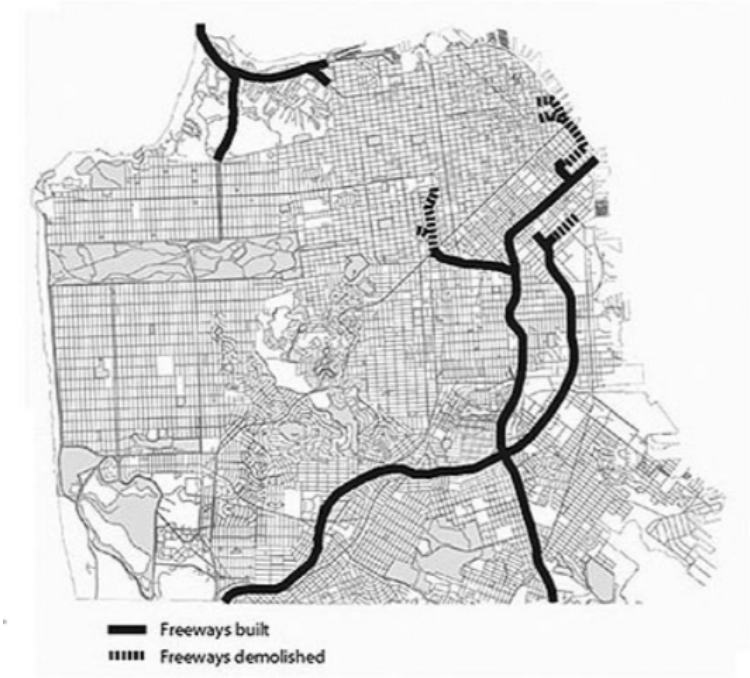

Figure 2.21. Diagram showing freeways built in San Francisco, and in dotted lines those built and demolished (compare to Figure 1, the 1948 San Francisco Trafficways Plan). FoundSF, http://www.foundsf.org/index.php?title=File:Fwy-revolt_plan_dept_maps.jpg (Accessed November 26, 2017).

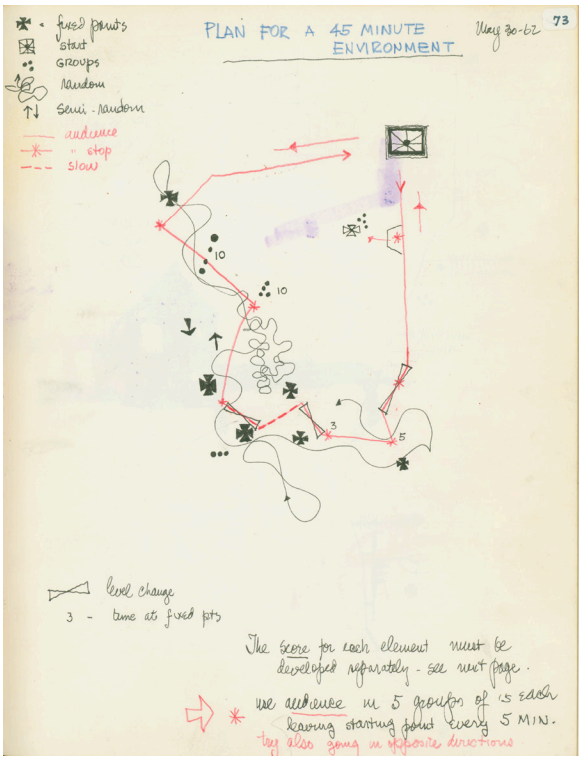

Figure 2.22. Score drawn by Lawrence Halprin for "A 45-Minute Environment," a site specific improvisational dance piece by Anna Halprin. May 30, 1962. Lawrence Halprin Collection, The Architectural Archives of the University of Pennsylvania.

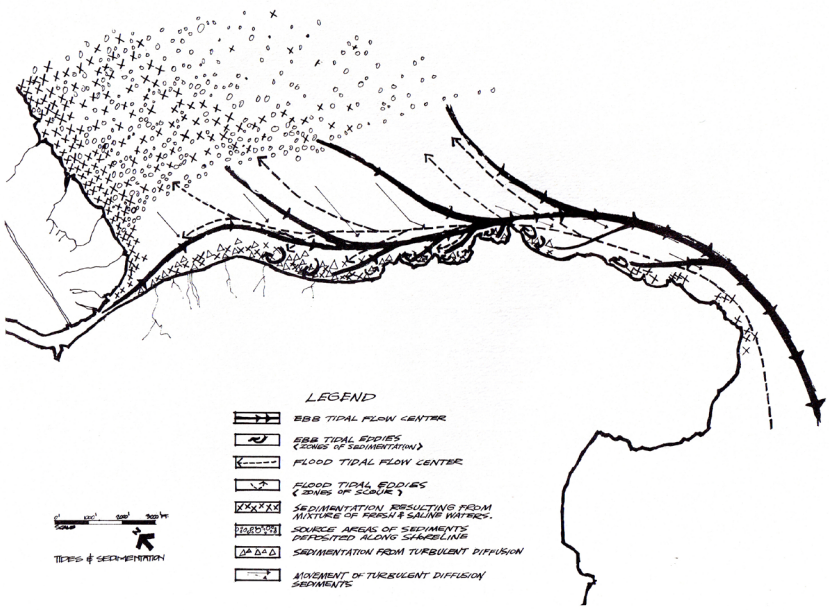

Figure 2.23. Diagram of tidal flows, Peacock Gap redevelopment project, 1964. *Peacock Gap: A Preliminary Report on its Oecological Development* (1963), 014.I.A.2003-.2012, Lawrence Halprin Collection, The Architectural Archives of the University of Pennsylvania.

CHAPTER THREE

RIDING FREEWAYS, PERCEIVING CITIES, ELIDING POLITICS: INCLUSIONS AND EXCLUSIONS IN THE VIEW FROM THE ROAD

> The principal objectives in shaping the highway visual experience may now be summarized. The first is to present the viewer with a rich, coherent sequential form… The second objective of the design is to clarify and strengthen the driver's image of the environment, to give him a picture which is well structured, distinct, and as far ranging as possible… The third objective is to deepen the observer's grasp of the meaning of his environment: to give him an understanding of the use, history, nature, or symbolism of the highway and its surrounding landscape.
>
> - Donald Appleyard, Kevin Lynch, and John Myer, *The View from the Road*, 1964[1]

In March 1962, one month after his firm was hired by the California Division of Highways to redesign San Francisco's Panhandle Freeway, Lawrence Halprin wrote to Kevin Lynch, professor of urban planning at MIT. "Dear Kevin: I hear through the grapevine that you are developing a study on The Form of the Highway. This is a wonderful thing for you to have done." Halprin then explained his new project, concluding: "This is, as you can imagine, a most difficult and challenging task and I need everyone's help. I wonder if it would be possible for me to see your material to help formulate our program." A week later Lynch replied: "Dear Larry, We have a draft report on our studies of the visual experience of the highway… Unfortunately, all our copies are out to readers at the moment. When we have one back, we will send it to you… it may be a month or so."

Lynch's book would not be published until 1964, the same year that Halprin's freeway work in San Francisco concluded. It is unclear whether Halprin ever received a draft in the

[1] Donald Appleyard, Kevin Lynch, and John Randolph Myer, *The View from the Road* (Cambridge: Published for the Joint Center for Urban Studies of the Massachusetts Institute of Technology and Harvard University by the M.I.T. Press, 1964), 18.

meantime. If and when he did, he would have discovered a markedly new approach to design drawing, one that constituted a significant departure from the more traditional design methods and techniques that his own team used for their Panhandle Freeway work.[2] Lynch's design proposal for Boston's Central Artery, for example, appeared as a series of un-scaled diagrams composed of nebulous, overlaid, intertwined forms. In one diagram of the proposed route (Figure 3.1, "Orientation, Clockwise") the freeway was a series of chopped curvilinear segments weaving through an intricate jumble of zigzags, ellipses, stars, arrows, dense clusters of small triangles, fields of dots, and crenellated lines. In plan (Figure 3.2), the proposed freeway swelled and diminished along its circuit, a sinuous amoebic loop tucked against vaguely recognizable land-edges and waterways. Along this loop roadway and city alternately contrasted and blended: in some places, they were demarcated by dark edging, in some the freeway was embedded in swaths of nubby urban texture, in others it floated against blank space. Throughout, fine radial lines cast out from the road's edges, threading the freeway into the open expanse of the city.

These drawings were the culmination of *The View from the Road* (VFTR): a book on freeway analysis and design written by Lynch, Donald Appleyard, and John Myer. An extension of Lynch's preceding research on urban form with his MIT School of Architecture and Urban Planning colleague György Kepes, the book was a unique work based on a novel process. This visually rich monograph presented new analysis and design approaches that were specifically tailored for the design of urban freeways. The authors' goal was to demonstrate techniques and

[2] It seems unlikely that Halprin did see the book in draft form. Given the representational puzzles that remained unsolved in the Halprin team's work on the Panhandle Freeway, and the fact that Halprin was also beginning to explore movement notation in the early 1960s, it is difficult to imagine that Appleyard, Lynch, and Myer's work, once viewed, would not have had at least some visible influence on the Panhandle drawings.

methods through which designers could make driving experiences more pleasurable, and make cities more comprehensible for freeway riders.[3]

Broadly, the authors wrote, the VFTR study "was motivated by the promise of the new world of vision inherent in our speed of movement, and by a desire to find a visual means for pulling together large urban areas."[4] More immediately, the goal was to devise new methods and techniques for designing highways, so that the experience of driving could be more visually coherent and aesthetically pleasing. Towards this end, the designers sought to compose new approaches to designing the urban fabric. They largely set aside traditional uses of plan, section, perspective and axonometric drawings in favor of a unique process that mixed narrative, data, and graphic notation. The result was a complex, dynamic, relational vision of the freeway/city complex derived from an almost hermetically narrow sliver of experiential information.

The new approach was paradoxical: inclusive in intent yet reductive in content, radical in technique yet tentative in politics. This very mix of design innovation and political caution demonstrated the puzzle that U.S. urban designers faced when attempting to reimagine cities on environmental terms in the 1960s: even relatively inclusive, holistic urban visions remained simplistic and partial relative to the massive scales and social, environmental, political complexity of the ever-expanding urban metropolis. In the face of such complexity, designers and planners increasingly found themselves renegotiating the very terms of their cultural and technical expertise, as well as their roles and responsibilities relative to the social and environmental futures of cities and urban regions.

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[3] The final published book was a complex document in its own right. However, I will mostly forgo discussion of its many parts here, in order to focus more intensively on the design process that was at the core of the VFTR project.

[4] Appleyard, Lynch, Myer, *The View from the Road*, 63.

In tackling this complex of issues, the VFTR project explored similar themes and questions to the Halprin project discussed in Chapter Two.[5] Both teams were interested in designing for interactive urban wholeness. Both described the "urban environment" as a dynamic, lived condition, and deployed the term in both extension and repudiation of aesthetic approaches to cities.[6] Both retained modernist notions of the designer as a cultural visionary, failing to recognize the extent to which political turmoil surrounding freeways put their vanguard roles into question. Unlike the Halprin team, however, the VFTR team embraced freeway design as an opportunity to not only articulate an emergent urban environmental vision, but also to draw it: to craft new design methods and drawing techniques that could better engage the city at massive scales, via movement, and according to the relational complexities of cities. Towards this end, the VFTR team performed a subtle dance with data, objectivity, subjectivity, universality, and their own roles in the project. In essence, if the history of Halprin's Panhandle project reveals what is lost or gained in *not* depicting a city as an interactive whole, the VFTR project offers an opportunity to instead ask: what is lost or gained in *attempting* to depict a city as an interactive whole?

In this chapter, I pursue this question by tracking the development of the VFTR team's methods and techniques, analyzing archival material in order to elucidate the processes underlying key diagrams presented in the book.[7] In doing so I demonstrate how the designers

[5] As with Halprin and Associates' Panhandle work, it is often difficult to discern in this project exactly who did what: some texts are attributed, others are not, and process tables and drawings are unsigned. Furthermore, while Lynch was clearly the project lead early in the VFTR work, Appleyard's listing as the book's first author suggests that he played an increasingly significant role over time. I generally refer to Appleyard, Lynch, and Myer as a group in this chapter, either as "the VFTR team," "the designers," or some other collective descriptor, except in cases where authorship is clearly noted.

[6] By the mid-late 1960s, Halprin's urban design work would converge even further with Lynch's in its focus on participant input and score-based design. See Chapter Two.

[7] *The View from the Road* includes many diverse visual approaches, including several sequential series of sketches and photographs. This wealth of material, while relevant to the book's overall approach and

moved between drastically different ways of perceiving, visioning, and composing the urban environment: mining personal observation as a source of immanent encounter, transforming that material into data in an attempt to make it more objective and universal, and then engaging drawing as a peculiar mix of both transcendent and objectivizing impulses. I thereby examine the VFTR team's attempts to express the irreducibility of urban experience alongside explicit efforts to deconstruct that experience. I reveal which aspects of the urban environment they enacted as irreducible, and show how they constrained and channeled the resulting information in order to create fixed form. I also reveal how the team's innovative, intricate process of computational reduction and visual recomposition failed to account for local social dynamics and political controversies, due in part to the socially narrow character of their environmental vision.

As in Chapter Two, I will demonstrate that drawing is a messy practice, and as such an often anti-regimic one. I will establish yet again that as transitional experiments, freeway projects were as incomplete as they were ambitious in their efforts to design for environmental experience at urban scales. I will also move beyond the themes introduced in Chapter Two: investigating the particularities and peculiarities of an innovative attempt to envision cities as dynamic, experiential wholes, and revealing ways in which such envisioning can mask or evade essential social issues, even while achieving new levels of comprehensiveness.

From "The Perceptual Form of the City" to "The View from the Road"

Prior to publishing *The View from the Road*, Lynch spent nearly a decade considering how best to approach highway design. In 1954, he and Kepes obtained funding from the Rockefeller

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message, did not all feed directly into VFTR team's design process. Because my focus here is on that process, I will discuss the diagrams and design drawings that evolved directly out of the team's initial driving narratives, so that I can track the designers' steps of observation, analysis, translation, and design, from initial site visits to final proposal.

Foundation for a five-year research project on urban form entitled *The Perceptual Form of the City* (*Perceptual Form*).[8] The project investigated new research and design methods that could identify and design for peoples' visual experiences of cities, with the goal of increasing their abilities to navigate and comprehend urban environments. In one of several proposal drafts submitted to the Rockefeller Foundation, Lynch and Kepes argued that contemporary urban growth thwarted peoples' comfort and ease within cities. They wrote:

> One of the basic difficulties confronting us is that today the city dweller is out of scale with his environment. Seemingly it is too big, too fast, too staccato in its proliferation of images and meanings. If we cannot turn backward to past forms and past ways of life, then there is a mutual adjustment required between men and their cities.[9]

In order to support this adjustment to larger scales and faster speeds, Lynch and Kepes proposed that new urban designs – and specifically new tools, techniques and methods – were needed:

> New tools and techniques are also required for use of the practicing architect or planner in conceiving and expressing his effects in urban design. Development of such methods for architectural design (plans, elevations, sections, perspectives, models) had a significant effect in unfolding the creative power of the architect in dealing with the single building. Such techniques are very imperfect on the community scale.[10]

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[8] György Kepes was a visual artist and theorist. Hungarian-born, he began working for Bauhaus instructor Laszlo Moholy-Nagy in Berlin, moved to London with him in the 1930s, and joined him on the faculty of the New Bauhaus in 1937. In 1946 Kepes joined the faculty of the School of Architecture and Planning at MIT; in 1967 he founded the school's Center for Advanced Visual Studies; he retired in 1974. Lynch had a notably diverse and varied design education: after a series of brief stints studying architecture at Yale and under Frank Lloyd Wright at Taliesin, studying engineering at Rensselaer Polytechnic Institute, and serving in the Army Corps of Engineers in WWII, Lynch completed a Bachelor's degree in City Planning in 1947. After graduating, he became a lecturer and then a full professor in the School of Architecture and Planning at MIT, until his retirement in 1978. For a brief overview on Kepes, see Alice Rawsthorn, "György Kepes, Wizard of Light and Motion, Comes Back Into Focus," *The New York Times*, March 18, 2015. On Lynch, see Tridib Banerjee, and Michael Southworth, *City Sense and City Design: Writings and Projects of Kevin Lynch* (MIT Press, 1990).

[9] "Proposed Study: The Perceptual Form of the City," Draft Research Proposal, March 4, 1954. Rockefeller Foundation Collection, Rockefeller Archive Center. It is worth noting here the resonance of this comment with Kepes' concept of the "new landscape," cited in the Introduction.

[10] "The Three-Dimensional Urban Environment," Draft Research Proposal, October 7, 1953. Rockefeller Foundation Collection, Rockefeller Archive Center.

According to the *Perceptual Form* proposal then, new design approaches could lead to greater urban "imageability," as Lynch called it: they could support urbanites to envision the entire form of their city, orient themselves within that form, and thereby navigate their urban environs with ease.[11] In this formulation, navigability was directly associated with perceiving the city as a whole, and that wholeness in turn was a defining characteristic of the "urban environment." These associations were reinforced throughout *Perceptual Form* project writing. In "The Three-Dimensional Urban Environment," Kepes and Lynch described the metropolitan region as: "a great physical structure," with "a complex relationship to a large number of interacting economic, social, technological and psychological forces."[12] Working on the project in the summer of 1956 as a graduate assistant, Julian Beinart wrote: "With this understanding of some of the ways in which man relates himself to his multi-dimensional environment, we can learn… to what extent we can create a surrounding environmentology which will allow him the maximum possibility of perceiving the city as a whole."[13]

Lynch and Kepes wrote about urban environments outside of the *Perceptual Form* project as well, from the mid 1950s through the mid 1960s.[14] In various articles and publications, each drew diversely on cybernetic models of complex systems, psychological research on perception, and Gestalt ideas regarding human abilities to perceive the emergent qualities of complex interactive wholes, to conceive of the urban environment as something defined by human

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[11] Lynch would articulate this position and related design principles at length in his later published outcome of the *Perceptual Form* work, the seminal *The Image of the City*. Kevin Lynch, *The Image of the City* (MIT press, 1960).
[12] "The Three-Dimensional Urban Environment."
[13] Julian Beinart, "The Morphological Study of the City: an Analysis of the Perceptual Devices," Perceptual Form of the City, Kevin Lynch Papers, MIT Institute Archives.
[14] See, for example, Kevin Lynch, "Environmental adaptability," *Journal of the American Institute of Planners* 24.1 (1958), 16-24; Kevin Lynch, "The City as Environment," *Scientific American* 213.3 (1965), 209–219; György Kepes, *The New Landscape in Art and Science* (Chicago: P. Theobald, 1956), 18-28.

sensory experience.[15] This urban environment was a social whole: defined by the ways that people perceived and conceptualized built form. Such perception, according to both Kepes and Lynch, was not aesthetic but rather organizational: a matter of making sense of a complex and chaotic world so that one could operate securely within it.[16] Kepes wrote, for example, in the introduction to *The New Landscape in Art and Science*:

> We make a map of our experience patterns, an inner model of the outer world, and we use this to organize our lives. Our natural "environment" -- whatever impinges on us from outside -- becomes our human "landscape" -- a segment of nature fathomed by us and made our home.[17]

Even when defined at very large scales then, Kepes' and Lynch's "urban environment" was defined by how it was experienced and lived, and understanding the organization of that environment was essential to living comfortably within it. In this sense, their urban environment

[15] These three influences were strong in the both Kepes' and Lynch's work. Kepes sought submissions by Norbert Weiner and other cyberneticists for edited publications such as *The New Landscape* and his *Vision + Value* series. M. Christine Boyer describes how Kepes integrated the cybernetic notion of equilibrium with Gestalt notions of wholeness in order to develop a model for how humans achieved stability and comprehension in a scattered, fragmented world; she also details how Lynch adapted this idea as well as the two worked on the *Perceptual Form* project. Hashim Sarkis and Divya Rao Heffley have detailed the influences of psychologists of perception such as James Gibson on Lynch's work, recounting his occasional correspondence with them and efforts to enlist them in collaboration. Heffley also details the role of Gestalt thinking in Kepes' and Lynch's collaboration. Anthony Raynsford has discussed the ways that these various influences were integrated into Lynch's work. For more on connections between Gestalt thinking and certain Modernist design practices, see Chapter Four. M. Christine Boyer, "The Two Orders of Cybernetics in Urban Form and Design," in Banerjee, Tridib, and Anastasia Loukaitou-Sideris, eds., *Companion to Urban Design* (Milton Park, Abingdon, Oxon: Routledge, 2011), 70-83; Hashim Sarkis, "Disoriented: Kevin Lynch, Around 1960," in *A Second Modernism: MIT Architecture, and the 'Techno-Social' Moment*, ed. Arindam Dutta (Cambridge, Massachusetts: SA+P Press in collaboration with the MIT Press, 2013), 394-435; Divya Rao Heffley, "Vision in Motion: Architectural Space Time Notation and Urban Design, 1950-1970" (PhD diss., Brown University, 2011), 42-52. Anthony Raynsford, "Civic Art in an Age of Cultural Relativism: The Aesthetic Origins of Kevin Lynch's Image of the City," *Journal of Urban Design* 16.1 (2010), 43-65; Anthony Raynsford, "Spectacle of the Hyper-Real: Environmental Simulation, Cybernetic Subjects, and Urban Design," eds. Mark Goulthorpe and Amy Murphy, *100th ACSA Annual Meeting Proceedings, Digital Aptitudes* (2012), 654–660.

[16] Anthony Raynsford has discussed Lynch's gradual shift away from more traditional approaches to urban aesthetics, noting ways in which Lynch mixed urban aesthetic theory with sociological approaches in order to develop a more pluralistic approach to urban design. Raynsford, "Civic Art in an Age of Cultural Relativism."

[17] Kepes, *The New Landscape*, 18.

was not a multi-species ecology, but rather a single-species one: a human habitat in which everyday experiences of urban systems forged essential interconnections among the parts.[18]

Shortly into the *Perceptual Form* project, Lynch began exploring highway design, describing his work as a study of "The Sensuous Impact of Highway Driving." This new project was described in Lynch and Kepes' 1955 progress report to the Rockefeller Foundation, and further detailed by Lynch over the following two years.[19] In a set of 1957 notes titled "Principal Elements of the Highway Experience," Lynch proposed that the highway offered a means to further develop the *Perceptual Form* research. Expressing an interest in "the way in which the total environment is identified and structured," he defined this quality as "imageability."[20] He also began to consider specific ways in which spatial design principles could be adjusted to address highway design, noting that while the "spatial envelope" through which one moves was a familiar notion in design, it had not yet been dealt with at the scales and fast speeds of highway travel.[21] In this emerging work Lynch interconnected urban structure, highways, new perceptual experiences, and environmental holism, and proposed to engage these matters on visual terms.

By 1958, Lynch was working on several projects concurrently. He and Kepes began wrapping up the *Perceptual Form* work; he was writing *The Image of the City*; and was

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[18] Lynch frequently focused on the experiential and aesthetic qualities of perception, but he also saw perception on more functional terms, as a structuring element of urban systems. Related to this, he sometimes framed humans as organisms within a biological urban environment. Lynch, "Environmental Adaptability," 16-17; Raynsford, "Civic Art in an Age of Cultural Relativism."

[19] This text is not dated, but it clearly precedes Lynch's other writings on highways in that period. Divya Rao Heffley has conjectured that it is likely from 1956 given references to it in other notes by Lynch from this time. "The Sensuous Impact of Highway Driving," Kevin Lynch Papers, MIT Institute Archives. Heffley, "Vision in Motion," 64.

[20] Kevin Lynch, "Principal Elements of the Highway Experience," December 1, 1957, Kevin Lynch Papers, MIT Institute Archives. For more on Lynch's concept of "imageability," see Lynch, *The Image of the City*.

[21] Lynch, "Principal Elements of the Highway Experience." Lynch discusses urban "texture" here as well, in resonance with Halprin's discussion of the urban environment discussed in Chapter Two.

launching the highway study with Appleyard, then a graduate student in urban planning, and Myer, a new faculty member in architecture at MIT.[22] In their final "Summary of Accomplishments" for the Rockefeller Center, Lynch reported that in collecting and analyzing the narratives of urban dwellers, he and Kepes had successfully developed methods for deriving principles of urban perception.[23] He also explained that they had not yet achieved their goals with regards to developing new graphic techniques for visualizing and designing urban environments.[24]

Regarding these new graphic techniques, Kepes and Lynch had used the *Perceptual Form* project to test some of their initial ideas: with the assistance of Beinart and MIT architecture alum Philip Thiel they developed a photographic library on urban form, created a negative spatial model of Beacon Hill, conducted studies of the city as seen through paintings and novels, and created photo-sequence analyses of pedestrian movement through Copley Square.[25] In concluding the project, however, Lynch determined that these experiments were ultimately not

[22] When he began working with Lynch, Appleyard was a graduate student in City Planning with a prior degree in architecture from the AA. His position shifted over the following few years as the team completed the VFTR project. In 1958 Appleyard graduated; from then until 1961 he worked as an architect, first in Cambridge, MA and then with DeMars Reay and Associates in Berkeley, CA. He returned to MIT as an Assistant Professor in 1961, and then in 1967 took a position at UC Berkeley. Myer had graduated from MIT with a bachelor's in Architecture in 1952 and traveled in Italy on a Fulbright after that. In 1958 he joined the MIT faculty and also opened an architectural firm, Ashley, Myer, Smith. Heffley, "Vision in Motion," 67. Interview with John R. Meyer, *Arude Magazine*, http://arudemag.com/john-r-myer/. Last accessed July 26, 2017.

[23] In this case, such urban dwellers were not drivers, but pedestrians. In correspondence with Rockefeller Foundation grantors, Lynch described soon to be published *The Image of the City* as the outcome of this work. Kevin Lynch, "Summary of Accomplishments: Research Project on the Perceptual Form of the City," April 1959. Kevin Lynch Papers, MIT Institute Archives.

[24] Ibid.

[25] Some of these representational experiments were conducted by Thiel and Beinart during the summer of 1956. Thiel, for example, composed a photo-sequence of moving through Copley Square, and wrote about other possible graphic approaches for recording movement through cities. Philip Thiel, "Morphology Study – Copley Square," August 13, 1956, Kevin Lynch Papers, MIT Institute Archives. Philip Thiel, "Notes on a method of recording and analyzing sequences of urban space and color," July 30, 1956, Kevin Lynch Papers, MIT Institute Archives.

successful: the photographic library was too detailed, the negative model too difficult to read, paintings and novels were too individualized to provide objective information regarding urban form. Other possible graphic studies meanwhile, such as motion pictures documenting sequences of movement through the city and photographic studies of physical models, remained as yet untested.[26] As Lynch's attention shifted towards the highway study, then, he brought along the *Perceptual Form* project's conceptual framework, its tested survey methods, and a desire to realize its as-yet untested design potentials.

Driving the Northeast Expressway

Over several months in 1958, Lynch, Appleyard, and Myer launched their data collection for the highway project. As Lynch had occasionally done in when surveying pedestrians for *The Image of the City*, they began by collecting narratives. In this case however, unlike those earlier surveys, the stories were their own. The team took drives together on urban expressways in several cities, including Philadelphia, New York City, Hartford, and Cleveland, documenting their observations via tape recorder.[27] In addition to their recorded observations, they tested a range of documentation techniques: taking photographs and recording film from the passenger seat, and asking several passenger-volunteers to quickly draw what they saw while riding. Then in December 1958, Lynch and Appleyard recorded three drives along the Northeast Expressway in Boston, which connected highways to Boston's northeast directly to the city center: traveling

[26] Lynch described exactly which proposed techniques had been tested and which remained untried in their project summary. Lynch, "Summary of Accomplishments."

[27] It is not entirely clear how the team selected these cities. It appears that they may have been chosen somewhat by chance, according to proximity and travel plans. In the existing transcripts, it is not often noted who exactly was in the car; however, mentions are often made within the recorded dialogue. In early drives Myer was often present. In one instance Lynch's wife was present, though with the exception of one brief interjection, she did not speak during the ride. Highway Notes, Kevin Lynch Papers, MIT Institute Archives.

over the Mystic River Bridge and terminating on the city's partly constructed Central Artery. The recorded narratives from these three drives became the raw material for the design analyses published in VFTR.

The Northeast Expressway was utterly new, having just opened earlier that year. The Central Artery, meanwhile, was partly constructed: one part had opened in the mid-1950s as the first piece of an Inner Belt freeway circuit, planned in 1948 to link several Boston neighborhoods with the towns of Cambridge, Somerville, and Brookline.[28] The Central Artery and the Inner Belt plan as a whole were highly controversial. Much like San Francisco's Embarcadero Freeway, the Artery was an early attempt to build an elevated freeway in Boston's city center; also like the Embarcadero, it required the condemnation and demolition of numerous city blocks, and separated the downtown from the city's historic waterfront. As a result, many residents despised the Central Artery before it even opened, as they had watched its construction destroy neighborhoods throughout the early 1950s (Figure 3.3). In response to public criticism, in 1954 the Massachusetts Department of Public Works (DPW) altered their plans in order to locate the remainder of the artery underground. This portion was still under construction during Lynch and Appleyard's drives; it would open in 1959.[29]

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[28] This plan was prepared in response to Massachusetts Governor Bradford's 1947 appointment of a Joint Board to prepare a metropolitan highway plan for Boston, in follow-up to the Boston Planning Board's 1930 *Report on a Thoroughfare Plan for Boston*. The plan was composed of the Inner Belt and eight radial freeways, of which the Northeast Expressway was one. Charles A. Maguire and Associates, *The Master Highway Plan for the Boston Metropolitan Area* (Joint Board for the Metropolitan Master Highway Plan, Boston, Mass., 1948); Robert Harvey Whitten, *Report on a Thoroughfare Plan for Boston* (Boston Mass.: City Planning Board, 1930).

[29] Langfey C. Keyes and Gordon Fellman, "Neighborhood Protest of An Urban Highway," *Journal of the American Institute of Planners* 35.2 (1969), 118–122. See also K.S. Bartlett, "Boston's $110,000,000 Highway in the Skies," *The Boston Globe*, August 8, 1954; *Inner Belt and Expressway System* (Massachusetts Department of Public Works, 1962); Yanni K. Tsipis, *Boston's Central Artery* (Arcadia Publishing, 2001).

Appleyard and Lynch recorded their drives on the Northeast Expressway three times in one day. Each time they started outside the city at the northern side of Revere, MA and continued over the Mystic Bridge towards the city center, averaging 45 miles per hour: a speed considered fast at the time.[30] They exited roughly five miles and twelve minutes later, when they reached the Central Artery's temporary termination in downtown Boston (Figure 3.4). In the first drive Lynch narrated and Appleyard drove, in the second Appleyard narrated and Lynch drove, and in the final drive Appleyard and Lynch had a conversation while a third person drove. Their taped narratives were then transcribed into three different seven-page texts.

The resulting accounts were vivid and sometimes poetic in detail, with occasional expressions of likes or dislikes. Comments tended towards stream-of-consciousness observations and loose impressions: in this way, the flow of descriptions reflected the speed and fluidity of freeway traffic itself. For example, here are Lynch's comments, 2 ½ - 3 minutes into the drive, as the freeway curved around hilly topography between Revere and Chelsea:

> The car is now sweeping and we're sweeping through the cut down to the left, and we seem to be going away from those big buildings on the ridge toward a smoke lying on the road and behind that a big bare hill and behind that you get a feeling of space. There are shadows crossing the road. The ridge on the left has a pleasant quality, tone to it with the trees on it and the rocks as we pass through it with laundry flying in the wind.[31]

Appleyard's comments were similar in content, flow, and tone, as demonstrated 7 ½ - 8 minutes into the route, as Lynch drove across the Mystic Bridge:

> It's slowly passing over us, [the Mystic Bridge], and we don't see ahead, because the curve of the road is up in front of us and now we can see straight ahead through to the toll station which is on a gentle slope down to the other side. Quite a few cars ahead of us. Shadow on the road. Now we can see the whole of Boston, really, all of downtown

[30] This was in keeping with standard highway speed limits in the mid-1960s, which were typically between 45 and 55 miles per hour, depending on road location and configuration.
[31] "K. Lynch – Mystic River Bridge," December 6, 1958. Highway Notes, Kevin Lynch Papers, MIT Institute Archives.

> Boston. Terrific! In silhouette, sort of a hazy silhouette, with the bright reflection on the water and the cranes in front of that, and way on the left you can see the sea, the airport.[32]

By the third drive, Appleyard and Lynch's earlier open absorption was tempered with the familiarity of recent repetition, and they identified which sequences they enjoyed and which they disliked. At 8 ½ - 9 minutes, for example, the duo passed through Charlestown:

> KL: …and it's really the other side of this bridge that you get the sense of the city. I like very much the way those chimneys move against it as a sort of foreground.
> DA: Yes, that's very good indeed with the red and white chimneys…
> KL: It's really chaotic down here. Good lord, how are you going to get through that.
> DA: Yeah, you see cars climbing ramps in both directions – yeah, it certainly seems to be three different roads. A really big city feeling about that, isn't there? And now we're level with the level we're going to be in the future. And we go through this fantastic dip at Charlestown.
> KL: This is a nice little event. It has nothing to do with the city but it's a nice one.
> DA: Yes, very memorable actually, you always remember it.[33]

On these drives, both designers practiced a sort of total perception of urban spatiality: seeming to note everything they could, from the immediate textures of pavement to distant visions of an entire city. While this open, immersive way of seeing fit with their various influences in psychology and Gestalt thinking, it also reflected the very novelty of the freeway experience in the late 1950s. The Northeast Expressway, after all, had just opened, and throughout the country, elevated urban freeways were still somewhat novel. One glimpses that novelty in, for example, Appleyard's delight at seeing all of Boston when he declared: "quite a few cars ahead of us. Shadow on the road. Now we can see the whole of Boston, really, all of downtown Boston. Terrific!"[34] In moments like these, Lynch and Appleyard's phrasing and exclamations often communicated delight, surprise, even awe.

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[32] Ibid.
[33] "Kevin and Donald," December 6, 1958. Highway Notes, Kevin Lynch Papers, MIT Institute Archives.
[34] "Appleyard – Mystic River Bridge."

Also in the spirit of this novelty, Lynch and Appleyard's narratives seemed relatively unconditioned by existing expectations regarding how the city should appear. For example, on their third drive they delighted at chimneys, on and off ramps, and dips in the road. Such appreciations of industrial surrounds and infrastructural forms departed from more conventional urban aesthetics, that would typically privilege civic and green spaces.[35] In this withholding of assumptions Appleyard and Lynch demonstrated a shared interest in setting aside traditional notions of urban beauty in favor of cultivating a total perceptual experience: a full-body comprehension of the urban surrounds in all its complexity.

Alongside this marked openness, however, Lynch and Appleyard also critiqued their surrounds, primarily on spatial terms. In one example, Appleyard tracked how locational arrangements caused visual obfuscation and reveal, noting: "we don't see ahead, because the curve of the road is up in front of us and now we can see straight ahead through to the toll station."[36] In another example, Lynch focused on dynamic effects of juxtaposition and depth, commenting, "I like very much the way those chimneys move against [the city] as a sort of foreground."[37] In such moments, Lynch and Appleyard evoked a sense of the freeway and its surrounds as a multidimensional, massive-scale, dynamic scenography, in ways that were markedly resonant with modernist notions of body/landscape relationship discussed in Chapter Two.

Whether expressed spatially, texturally, or otherwise, Lynch and Appleyard clearly experienced the city as a markedly relational phenomenon during these drives. The car's

[35] In another example of this openness, in an earlier ride that Appleyard, Lynch, and Myer took along the Schuylkill Expressway in Philadelphia, the three agreed that although much of the drive was lushly vegetated and therefore objectively ought to be pleasant, they nonetheless found it unpleasantly monotonous and confining. Highway Notes, Kevin Lynch Papers, MIT Institute Archives.
[36] "Appleyard – Mystic River Bridge."
[37] "Kevin and Donald."

constantly shifting position against the city highlighted the interactivity of driver, road, and the urban spaces beyond. The freeway's elevated position had a strong connecting effect: enabling car-bound travelers to look out over the city, see the relationships of its different parts in new ways, and watch the juxtapositions of those parts shift and change over the course of the journey. In these ways, Lynch and Appleyard seemed to experience a freeway-inspired holistic perspective of urban structures and life not unlike the one that Reyner Banham would so evocatively capture more than a decade later in *The Architecture of Four Ecologies*.[38] The novelty of seeing the city via the speed, elevation, and abstracted position of the car on the freeway seemed to reinforce the designers' very conception of the city as a dynamic, interactive whole.

How did these freeway drives relate to the project of *designing* the city? For one thing, the very act of making spatial perceptions explicit constituted a break with existing design practices. To this day, it is somewhat rare for designers to overtly describe on-site sensory experiences with that level of nuance and detail. As discussed in Chapter Two, designers continually draw on their experiences of moving through cities, buildings, and landscapes to attune to the unique qualities of sites and calibrate their design drawings.[39] Yet such sensations are typically utilized tacitly, rather than explicitly documented; Appleyard and Lynch's spoken and written descriptions therefore constituted a departure.

The other design ramification involves what Lynch and Appleyard did *not* discuss on their drives. By exclusively focusing on the sensory dimensions of freeways, the pair ignored a wealth

[38] Reyner Banham, *Los Angeles; the Architecture of Four Ecologies* (New York: Harper & Row, 1971). See in particular the introduction and "Ecology IV: Autopia."
[39] As discussed in Chapter Two, for example, the Halprin team's bodily awareness of spatial proportions and adjacencies informed their evaluations of different site layouts.

of other freeway characteristics. The impacts of freeway traffic on public health, economic ramifications of freeway systems, the political reality that poor and minority residents stood to bear the brunt of freeway-related displacements: all of these were excluded from Appleyard and Lynch's narratives. Such effects were sometimes present, but reduced to mere scenery: "smoke lying on the road," and "laundry flying in the wind." In light of the team's goal to design better freeways, this exclusively driver-centered, experiential approach was problematic to say the least.[40] It was also arguably deceptive in its elision of the designers' own political views and positions regarding Boston-area freeways.

The VFTR team acknowledged the narrowness of their visual focus, noting: "it is obvious that in actual practice other criteria would be of equal or greater importance."[41] Why, then, would they consciously adopt such a circumscribed approach? One possibility is that they were simply less interested in the practical design of freeways than in transforming how designers perceived, visualized, and reimagined cities. From this perspective, the freeway would be more catalyst than subject. Another possibility is that drastically limiting their focus was a practical design matter: given the scale and complexity of the freeway and its urban surrounds, even a narrow amount of material might easily mushroom into an unwieldy set of analyses and designs. The team did, in fact, suggest that this was a factor, noting that they had decided not to consider the views of the freeway from its outside "partly because our work required a sharper focus."[42]

[40] This problematically narrow focus would, in fact, be the major criticism mentioned in published reviews of *The View from the Road.* Reviewer Nathan Silver, for example, stated succinctly, "the idea of a visual analysis of the highway that ignores 'how the highway looks from the outside' is absurd." Nathan Silver, "The Movement Movement," *Progressive Architecture* 47 (1966), 178–186.
[41] Appleyard, Lynch, and Myer, *The View from the Road*, 39.
[42] Op. cit., 63.

From Text to Tables

Once their expressway narratives were transcribed into text, Lynch, Appleyard, and Myer began ordering and charting their contents. First the team distilled the texts into a series of timed observations. They marked all three transcripts with minute and half-minute markers. Then they made two charts, one for Lynch's narrative and one for Appleyard's (Figure 3.5). Along the top axis they listed eighteen different categories of things that might be observed in a freeway drive, such as "motion," "traffic," "signs," "topo," "road structure," "plants," and "people."[43] In thirteen rows, one for each minute of the journey, they marked the number of times per minute an item in each category was mentioned. They then tallied the marks for each category, added together their respective sums, and ranked the categories based on their combined totals: "A" for the most mentioned category, "B" for the next four most mentioned, and "C" for the following ten mentioned categories.

After completing these tallies, the team identified four different possible analysis diagrams. "Base Map" concerned "road structure, other major roads, topography, major features, etc." "Motion & Space Diagram" would be focused on "showing sense of self motion… apparent motion of exterior world where significant, basic space characteristics." "Orientation Diagram" would depict on the rider's "sense of topo, use-areas, connections, etc. - viewing of distant marks and sense of goal attainment." Lastly, "Visual Material Diagram" would show each "view classified as distant, intermediate, or R/O/W."[44] For all but "Base Map" the team summarized the minute-by-minute observations from all three narratives into one time-ordered list for each

[43] Although there is no explicit explanation in the team's notes regarding how they identified these categories, it appears that they derived them by extrapolating from the various objects that Appleyard and Lynch identified aloud in their narratives.
[44] These categories did not correlate with the most commonly observed categories; rather, the team aggregated multiple categories under different chosen spatial qualities.

diagram (Figure 3.6). For example, for the "Orientation Diagram," Lynch's observations at minute 2 ½ (text cited above), read:

> 2 ½ Out into valley, bearing L away from Ridge 2 down valley, reverse side Ridge 1 on L. At angles old direction

In the "Motion & Space Diagram" list, the same moment was listed as follows:

> 2 ½ Sweeping down to L
> Out into valley, higher up, at rooftop level
> Rd slides away left, pointing down valley, feels 90 degree turn
> Ridge sloping up L

The "Visual Material" list, meanwhile, was initially detailed in this same manner, reading:

> 2 ½ Turn hill
> Smoke ahead
> Shadows on rd
> R1 L, trees, rocks
> Laundry flying

After this, the team distilled the "Visual Material" list even further: they eliminated all descriptive information in a table that tallied whether the observed objects were near or far, and to the left, center, or right of the road (Figure 3.7).

Relative to the source narratives, these distillations were exceedingly reductive. Narrative flows were pared down to timed and categorized lists whose themes took an already visual, form-oriented set of observations and emphasized their spatial focus even further. Mentions of delight, ephemera, shadow and light, and natural features were all eliminated.[45] What remained was a depiction of relative positions: of viewer, road, and surrounding landmarks and features. In essence, the team's approach to generating consistent and metric data depersonalized the raw

[45] These mentions would have been addressed in the "Visual Material" diagram, had the team not reduced its material further.

material, removing all traces of affect or desire.[46] The team had translated their experiential source narratives into purportedly objective information.

This step enabled the designers to conduct a rather peculiar move regarding their own positions in the project, separating their roles as test subjects from their roles as designers. With all sentences broken and all traces of preference eliminated, the team had essentially translated their own subjective experiences into data. In the book's text, they underlined this separation further by obliquely referring to themselves in the third person: "the impressions of this road given below are those of two men who took the trip many times, both as driver and as front-seat passenger."[47] The designers thereby obscured their personal involvement as test subjects: to themselves, and to their readers.

This objectification of narrative information had roots in Lynch and Kepes' *Perceptual Form* research. In that study, they drew loosely on interdisciplinary influences in psychology and sociology to develop a method for tracking the perceptual experiences of urban dwellers: recording volunteers' walks through the city, having them later recount and sketch their walks from memory, and then using statistical analysis of the subjects' descriptions to derive a series of generalized observations. This approach was built on two related assumptions, both of which Lynch and Kepes parsed in writing. First, they argued that urban perception was a universal phenomenon, shared by all regardless of background. They detailed this assumption in their 1955 Progress Report to the Rockefeller Foundation, writing:

> The objection may first be made that subjective reactions are so colored by individual class or temperament, or by momentary concern, as to exhibit no usable consistencies.

[46] While expressions of preference did not make it into diagrams, the VFTR book's written descriptions of Appleyard and Lynch's drives did include expressions of preference that the designers had mentioned on the drive.
[47] Appleyard, Lynch, and Myer, *The View from the Road*, 29.

> We believe, however, that basic similarities will appear, since it is the same objects that are being viewed, since the process of perception is basically the same between all men, and because our particular subjects will possess a common culture. Important class differences will undoubtedly exist, and might be the subject of further studies. This inquiry, however, should concentrate on fundamental similarities, and simply report the range of individual differences without attempting to correlate these differences with other factors.[48]

Second, they proposed that due to this universality, with correctly "systematic" treatment, they could derive objective truths from subjective material.[49] In the *Perceptual Form* study, then, Lynch and Kepes developed a method for distilling pedestrian observations into general principles regarding how people perceived urban environments, and this method contained unresolved tensions regarding the degree to which personal experience could be objectivized or universalized. The VFTR team deployed the very same method, with the exception that they were now both participants and quantifiers of the experience.

From Tables to Diagrams

The next step in the team's process was to translate tables of phrases into visual form.[50] To explain how this translation occurred, I will discuss two of the four diagrams mentioned above:

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[48] "The Perceptual Form of the City: Progress Report and Plan for Future Studies," 7-8. Some scholars have suggested that such a universal position had already evaporated by now: Anthony Raynsford, for example, suggests that in this study Lynch and Kepes had largely jettisoned modernist ideas of the universal subject and instead embraced a more pluralist, cybernetics-inspired notion of urban experience, arguing that "nothing could have been further from the ideals Sigfried Giedion's high modernist convictions, which demanded the moral and aesthetic leadership of an artistic inner circle." That said, some of Lynch's design decisions suggest that this break was not quite as complete as it could sometimes appear: the comment quoted here and related practices show that some lingering notions of universality and artistic leadership still remained in this work. Raynsford, "Spectacle of the Hyper-Real," 657.

[49] According to Lynch and Kepes, "the technique of study seems to hold promise when it is applied systematically and compared carefully with a detailed objective description." "The Perceptual Form of the City: Progress Report and Plan for Future Studies," 10.

[50] There is little archival information showing the team's process of developing their graphic language, save for three diagrams hand-drawn in ink on 8.5x11 pieces of paper that preceded – and were quite similar to – the ones printed in the book. We know from the authors' own writing that they drew significantly on the notation work of Philip Thiel, whose influence was collegial and close, given his

"Orientation Diagram" and "Motion & Space Diagram." I focus on these diagrams because they best connect the VFTR project's first phase to its last: both were derived directly from Appleyard and Lynch's driving narratives, and each of their graphic languages would be utilized extensively in the project's design phase.

Like all the analysis diagrams, the "Space Motion Diagram," previously listed as "Motion & Space Diagram," (Figure 3.8) was to be read upwards from the bottom of the page. Here the team used a series of notations to chart Appleyard and Lynch's perceptions of their movement through the varying spatial volumes of freeway and city. This diagram was not scaled or geographically precise. Rather, it centered on Appleyard and Lynch's spatial experiences: of openness and enclosure, rising and descending, rotation and directional movement, and apparent speed.

Each of these spatial sensations was defined through a graphic notation, and those notations were integrated together into one diagrammatic illustration. For instance, sensations of rising and falling were shown via the width of the diagram's "road": greater width signified a feeling of height relative to the freeway surrounds, while narrowness depicted a sense of being in a low position relative to the urban context.[51] The curve of these road segments showed the sense of direction at each moment in the drive. The shifting edges of the road were sometimes edged with dark lines that symbolized a sense of the road having a strong edge or separation from its context.

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studies in architecture at MIT from 1948-1952 and his 1956 summer work on the *Perceptual Form* project. There is no evidence, however, that Thiel's work on the *Perceptual Form* project resembled the notation processes that he would shortly thereafter explore in his various writings on movement notation. For a representative example of Thiel's early 1960s notation work, see Philip Thiel, "A Sequence-Experience Notation," *Town Planning Review* 32.1 (1961), 33.

[51] According to the authors, this convention was derived by drawing two elevations of the road for each segment – one looking right and the other looking left – and then setting them base-to-base, so that greater height was further out from the freeway center line. Appleyard, Lynch, and Myer, *The View from the Road*, 22.

Short arrows overlaid on the road, meanwhile, denoted the driver's sense of the relative movement of the surrounding space. To the right of the diagram's main portion, a string of numbers correlated the timing of the route to a series of road-view photographs that were shown elsewhere in the book (Figure 3.9). To the right of that, meanwhile, small sectional diagrams showed Appleyard and Lynch's sensed spatial position at different moments in the drive. Here a dot stood for the car-bound observer, while horizontal, vertical, and diagonal lines of varied textures showed the juxtapositions that the rider experienced in each given moment.

The logic of each notation within the diagram was such that it directly represented the observations listed in the preceding tables. Minute three in the "Space Motion Diagram," for example (Figure 3.8, outlined), shows Lynch's observations cited above. As one's eye moves up the page, "Sweeping down L" and "Rd slides away left, pointing down valley, feels 90 degree turn" are shown in the road's narrowing and shifting far to the left. "Out into valley, higher up, at rooftop level" is not easily discerned in the road, but can be seen in the sectional diagram to the right, where the observer's dot is located higher than a flat plateau to the right, and at the base of a textured diagonal line to the left ("Ridge sloping up L" in the distilled text).

"Orientation Diagram" (Figure 3.10) was looser than "Space Motion Diagram." It was concerned with the car-bound observer's perception of the city as a whole, or what the authors described in their notes as the "image of the total landscape."[52] Along a narrow continuous central spine, an array of stars, hatched lines, triangles, arrows, and shaded areas denoted landmarks and nodes, senses of edges, districts, continuity and visibility of the broader landscape, and relation to perceived locational goals throughout the ride. Minute 2 ½ depicted an "edge" – a

[52] Highway Notes, Kevin Lynch Papers, MIT Institute Archives; Appleyard, Lynch, and Myer, *The View from the Road*, 35.

sense of leaving one zone and entering another – while turning left: a thick hatched horizontal line marked the edge, and a left-arrow along the spine of movement marked the turn. To the right of this, the ridges that the car navigated at this moment were visible in two unmarked vertical lines with pennant-shaped triangles. A large pennant aligned with the edge symbol and a gray left-moving arrow directly above it signified that one ridge had just been passed, and then was perceived to move to the left.[53] The other ridge was just coming into view, as shown by the fact that its small pennants overlapped slightly with those of the ridge just passed.

Needless to say, these diagrams were not easy to decode. Containing few familiar graphic conventions, they were idiosyncratic in content, shape, and form, and densely packed with unfamiliar, multiply encoded graphic conventions. That said, their visual languages were not entirely without precedent. While the VFTR team did forgo traditional uses of plan, section, and elevation, they also borrowed and collaged discrete aspects of each of those drawing types: abstracting, deconstructing, and reconstructing them into novel composite forms. Sometimes this reuse was obvious, such as in the sectional diagrams along the right side of "Space Motion Diagram." At other times, it was subtler. By composing the diagrams from the bottom of the page upwards, for example, the designers utilized the viewer's familiarity with looking at perspective drawings, in which the ground plane extends inward and upward from the perspectival frame. As the viewer's eyes traveled up the page to read the diagram, the path of their vision would be akin to tracking the ground plane "forward" in a perspectival image. By

[53] Specific "goals" were not identified in the published diagram, but they were marked as such on the earlier sketched draft of this diagram mentioned above. Highway Notes, Kevin Lynch Papers, MIT Institute Archives.

reinforcing the perspective's established visual conventions in this way, the VFTR diagrams could induce in the viewer a sense of forward motion.[54]

In accordance with the team's writings about perceiving the city as a whole, their diagramming choices encouraged viewers to perceive the city synoptically, at new, larger scales. They gave a great deal of attention to the landscape beyond the freeway, despite the fact that their earlier "Visual Material" study showed that spaces beyond the freeway were not, in fact, observed very much by those in the car. Indeed, in the published text beside their "Visual Material Diagram," the authors noted one major conclusion from this chart: "Half of all the comments had to do with things which were in the right-of-way, were near and apparently moving, and were in the central sector of vision. This limited portion of the landscape was disproportionately important as the source of visual material."[55] It would seem, then, that while the authors were clearly interested in working with discrete data in this project, fidelity to that data was less important than their broad interest in visualizing the city as a discernible whole.

With their analysis diagrams, the VFTR team incorporated traditional drawing conventions into a novel graphic language by extracting, multiplying, and collaging select aspects of familiar drawing types. In practicing this visual deconstruction and reconstruction, they simultaneously upended design drawing norms and tempered their diagrams' newness with familiar spatio-visual strategies. This strategic representational reuse retained a focus on spatial experience as central to the designing of space. At the same time, the team extended the spatial range of their diagrams beyond that which they understood to be typical for drivers, in an effort to envision the freeway

[54] It should be noted here that design diagramming was in itself a modernist convention, and one that designers often associated with objective analysis of spatial conditions. For a more detailed discussion of this topic, see Chapter Five.
[55] Appleyard, Lynch, and Myer, *The View from the Road*, 35.

surrounds at a larger, more expansive, indeed, a more "environmental" scale than it was typically perceived or understood.

Composing the Whole: From Analysis to Design

The VFTR team's final step was to test how their new graphic language could be applied in freeway design. As a theoretical site they selected Boston's Inner Belt, that partly built, controversial inner-ring expressway of which the Central Artery was the first constructed portion. Organized public opposition to the Inner Belt plan was growing in the same years that the VFTR team worked on their project. In 1960, 1,500 people attended a state DPW planning meeting to voice their opposition and present petitions against the freeway circuit.[56] Over the next few years, the city of Brookline and Boston's Fenway neighborhood each negotiated with the DPW to minimize the Inner Belt's impact on their residential areas. In 1965, Cambridge residents whose homes were directly threatened by the Inner Belt would form their own public resistance as well: building a well-organized and ultimately successful coalition with local architects and planners in opposition to the route.

The VFTR team used the contested 1948 proposal as their launching point, with the intention to modify it according to their design strategy. They acknowledged existing conflict over this proposal in their text, albeit mildly, writing: "although part of this inner ring has now been constructed, the location of other parts is controversial."[57] Otherwise, as in their analysis, the designers once again made the somewhat curious decision to select a conflict-laden project and then consciously sidestep the social, economic, political, and material conditions

[56] Keyes and Fellman, "Neighborhood Protest of An Urban Highway." 118.
[57] Appleyard, Lynch, and Myer, *The View from the Road*, 39.

precipitating the conflict, in order to focus exclusively on determining the route that would create the most experientially engaging drive.

The team's first step was to create a pair of plan-view diagrammatic maps of Boston as a whole. For "Structure Map" (Figure 3.11, top) they cross-referenced several sources – topographic and land-use maps, aerial photographs, and their own local knowledge – in order to show major streets, existing and historic shorelines, land uses, and major geographic features. For "Existing Image of Boston" (Figure 3.11, bottom) the team asked several residents to describe the city's layout, and then compiled the information into a representation of the city.[58] The content of these two maps was similar, but "Existing Image of Boston" was more abstracted: rather than showing land uses and streets, it used a graphic language similar to that of "Orientation Diagram" (Figure 3.10), showing, for example, nodes, edges, landmarks, open areas, and built-up areas.

Based on these two analysis maps, the team identified several "weaknesses" and "potentialities" of the city image. "Weaknesses" were ways that the city's organization was unclear, which the designers would seek to make more legible through freeway design.[59] For example, they noted that "the location of water in the city is confusing" and "the hub or radial pattern of downtown Boston, with its irregularly converging routes, is another source of disorientation."[60] "Potentialities" were characteristics that made the city's organization clearly apparent, which the designers would seek to reinforce in their freeway design. For example, "the downtown districts are varied and have distinctive landmarks," and "the surrounding hills

[58] This material was gleaned from Lynch's Image of the City work. Op. cit., 40.
[59] "The charting of such a map provides very useful information, for one primary aim of this highway design is to repair and reinforce this city image and to orient the driver to it." Appleyard, Lynch, and Myer, *The View from the Road*, 40.
[60] Ibid.

indicate specific locales."[61] With these observations in mind, the team traveled through the city roughly along the proposed Inner Belt route, taking side-trips to consider the broader environs and scout out alternative locations. They acknowledged that imagining a future freeway driving experience was difficult given that the freeway would significantly transform the environment, and that drivers would be elevated through the city. To account for elevation, they frequently looked out from the top floors of buildings in the proposal area.[62]

Next, the team developed their design. They depicted their proposed route through several drawings. First, they analyzed its experiential qualities through diagrams like those used to analyze the Northeast Expressway. In the "Orientation, Clockwise" (Figure 3.1), for example, the freeway was once again shown as a thin even strip threading through a network of stars for nodes, hatched lines for perceived edges between zones, stippled areas for distinct districts, and triangles for landmarks, with a series of vertical pennant lines to the right of the diagram showing the visibility of area features during different portions of the drive. In a departure from the analysis version, however, here elements from the team's plan-view analysis diagrams were also included: edges between water and land and area hills, and labels for landmarks, nodes, and other key locations. The diagram thus provided cues regarding the route's relationship to the city: the freeway appeared to be embedded in a dense and diversely structured urban context, with perceptual experiences of that context varying along the journey.

The "Space, Motion, and View, Clockwise" diagram similarly mixed the graphic conventions of its analysis predecessor ("Space Motion Diagram") with references to the city's geography. As in the earlier version, the width of the freeway path depicted the perceived height

[61] Ibid.
[62] Op. cit., 41.

of the road relative to the city; dark bars indicated the sense of edge experienced by the driver; and small arrows noted the sense of movement that the driver experienced along different parts of the trip. Added were locations of objects and landmarks, marked by text floating on a blank background. Also added were series of long, fine arrows extending out from the roadway, showing the angle and direction of notable driver views along the journey. Sometimes these arrows pointed to unmarked, blank zones; other times they pointed to specific sites, such as the city's Symphony Hall (Figure 3.12, upper right).

The team also represented the proposed Inner Belt journey in two plan-view diagrams depicting drivers' intended viewing experiences: one for clockwise travel, (Figure 3.2) and one for counterclockwise travel. These drawings repeated the other plan views' graphic languages: loosely rendering the city in land/water edges, "open space," and area hills, with the remainder of the urban fabric appearing blank. The driver's intended perceptual experience was largely depicted as in the "Space, Motion, and View" design diagram. The road widened and narrowed, depicting the perceived rise and fall of the freeway. Dark textured bars noted places where the driver would feel a strong sense of boundary between freeway and city, and triangles indicated landmarks. A network of fine lines radiated outward from the freeway, representing the views of the city that drivers would experience along different portions of the journey.

In their published book, the team described their general design proposal at length alongside these plans: first in broad strokes, and then in sequential detail. Broadly, they described how their design's modifications of the existing Inner Belt plan would enhance driver experience. First, a slightly tighter path closer to the center of the city would make the city's downtown more regularly visible from the freeway. Second, a more varied proximity to the center city would decrease monotony for drivers and riders. Third, reducing the number of exits

from six to three would reduce the frequency with which drivers needed to make navigation decisions while on the circuit. Lastly, subtle nuancing of specific angles and bearings of the road would serve to accentuate compelling views of landmarks, neighborhoods, or other features.[63]

The tactical and geographic clarity of this explanation offers a revealing counterpoint to the drawings: for the written description is as legible and direct as the drawings are complicated and opaque. Why this marked difference in clarity between word and image? Did the drawings' opacity demonstrate a basic failure of the designers' new techniques? Or was it simply a side effect of the diagrams' novelty, an outcome of encountering an utterly new design technique whose use would only be normalized with regular, repeated use? While both of these may have been true to an extent, there is yet another way to consider this contrast between written legibility and visual opacity. The written description explained the team's design intent on functional and structural terms. In contrast, the drawings depicted infrastructure and city on a far less familiar basis: as relational rather than built forms.

Throughout analysis and design, the VFTR team continually enacted driver, freeway, and city as intrinsically interconnected, in several ways. In their driving narratives, they perceived the city from the freeway. In analysis, they constructed the freeway purely as a phenomenon of urban viewing. In design, they knit vision, freeway, and city together such that they were inseparable: continually depicting driver, freeway, and city as mutually interdependent, and drawing the freeway never as a built structure, but rather as a nexus of interactions between the driver and the freeway environment. In these ways, the VFTR process and drawings alike bound driver, freeway, and city together, not via built form, but through an endless accumulation of momentary visual and spatial relationships among many actors and elements.

[63] Appleyard, Lynch, and Myer, *The View from the Road*, 45-47.

In this light, we might consider Kepes and Lynch's deceptively simple proposal that "it is the interactions in time and space between the individual parts that produce the significant effects of city form."[64] The VFTR project embraced this idea as a central motivation for design. They focused narrowly on its manifestations in drivers' sensory experiences, and then restricted their subject matter even further through reductive quantification and purportedly objective analysis. Despite these distillations, however, the final drawings were somehow more immersive than reductive. A viewer could choose to decode the many different ordered and structuring elements and develop an analytical understanding of the proposal. Or, they could step back from those details and simply be absorbed in the imagery, experiencing the drawings more as sensory landscapes than as concrete propositions. In the VFTR team's freeway design, the urban order that resulted was elaborately extensive, and interactive. It was also meant to be lived and sensed in its entirety, from within.

Reception and Revolt

When released in 1964, *The View from the Road* was 9.5 inches wide and 15.5 inches tall, and replete with diverse imagery. Inside were photograph sequences, abstract sketches, a "flip-book" series of sketched freeway perspectives on successive pages, and the analytical diagrams and abstract design drawings analyzed above. The book was organized into four sections. The first broadly described the phenomenon of the freeway environment and laid out the designers' understanding of how people perceived and experienced driving on freeways. The second explained the components of the notation process that the designers had invented. The third detailed how that process was used to analyze the Northwest Expressway, and the fourth explained the team's proposed design for the Inner Belt.

[64] "Proposed Study: The Perceptual Form of the City."

The book's text was efficient, light in tone, and interspersed with its diverse imagery. Throughout the text, the authors mixed precise, systematic analysis of the workings of drivers' vision and perception together with nuanced descriptions of the experiential, sensory aspects of freeway driving. They went into great detail, for example, describing the sensory phenomenon of freeway driving: unique ways that it induced specific perceptions of space, motion, speed, enclosure, and so forth. In folding interspersing aesthetic explorations with concerns for pragmatics, the book presented a mechanistic and yet almost transcendent notion of the driver's potential to experience something powerful in driving through the city. Often these different perspectives on freeway driving were mixed together at a fine grain. For example, the authors wrote:

> There is a positive pleasure in being able to recognize the urban scene and to fit it together. The fast highway is a new means for making the structure of our vast cities comprehensible to the eye. If consciously designed for the purpose, they could present the city as a vivid and well-ordered image.[65]

By proposing that freeway design should enable drivers to simultaneously experience sensory pleasure, comprehensibility, order, and vividness, the VFTR team suggested that the freeways could, on one hand, operate as enormous sculptures – in the authors' words, as "works of art" – offering drivers unique sensations, perceptions, and delights.[66] They also argued, on the other hand, that freeway design had the potential to enhance drivers' understanding of the coherence and comprehensibility of the city as a whole. Overall, this attitude was coherent with the VFTR team's notation approaches: they remained committed, in both image and text, to approaching freeway design on terms at once experiential and environmental, immediate and synoptic.

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[65] Appleyard, Lynch, and Myer, *The View from the Road*, 16.
[66] Op. cit., 63.

The VFTR team clearly hoped that their experimental methods and techniques would expand and extend beyond the book itself. They did continue to use some of the methods defined in the project: Lynch would use similar techniques in a planning study for Brookline, MA; Appleyard would continue to develop related notation and mapping techniques in work for the Bay Area Rapid Transit System (BART) and in his acclaimed San Francisco Street Livability study.[67] Beyond their own work, their specific techniques and methods did not spread in their entirety. The project would become a touchstone, however, in the following years: frequently referenced in publications and discussions regarding the potentials of freeway design. In this way the project succeed in contributing to freeway discourse; and in providing an experimental inspiration for future experiments in design innovation.[68]

This would appear to be the end of the story; and yet it is not quite. For Cambridge freeway debates in the years immediately following the book's publication cast the VFTR work in a somewhat different light: suggesting that the authors' deployment of their novel approach was not quite as direct, nor their evasion of local politics quite as complete, as they seemed. In a December 1966 review in *Progressive Architecture*, architect and critic Nathan Silver was harshly critical of the VFTR book. He argued that its exclusive focus on driver experience was foolishly single-minded. He also suggested that it indicated a somewhat deceptive stance regarding the contested Inner Belt design. Silver wrote:

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[67] Kevin Lynch, "An Analysis of the Visual Form of Brookline, Massachusetts (1965)," in Banerjee and Southworth, *City Sense and City Design*, 287-315.
Donald Appleyard, *Street Livability Study: An Urban Design Study Background Report* (San Francisco: Dept. of City Planning, 1970).

[68] Prior to its publication, some of this work appeared in a special issue of *Architectural Forum* focusing on freeway design. It was also read and discussed in 1967 by a group of federal urban advisors who produced *The Freeway in the City* (see Chapter Five). Today this work is still well known among architects: faculty and practitioners alike. *Architectural Forum* 10 (1963), 61-95.

> "The 'imaginary' nature of their proposal becomes harder and harder to remember, especially when the authors drop their soft design pencils and start jabbing at the official Maguire route. Page after page and diagram after diagram, *The View from the Road* slowly turns, like a game of Truth, from an abstract enthusiasm to deadly earnest. But it is not my intention to claim that a chief aim of the book was to promote the authors' own highway loop for Boston; I cannot prove that. It is enough for me that *The View from the Road*... is playing the game with, let us say, pretense.[69]

Silver's intimation that the authors had a hidden agenda with regards to their proposed Inner Belt route takes on greater significance when considered alongside the local politics that the authors had so assiduously avoided discussing in their text. While freeway resistance had been brewing for several years in Cambridge, by the time of Silvers' writing, it had taken on new force. In fall 1965, after several years of relative quiet, neighborhood residents began actively organizing against the Inner Belt's Cambridge portion, with the assistance of a newly formed organization, the Cambridge Committee Against the Inner Belt. This group of planners, architects, academics, and professionals offered their expertise to the largely working-class residents of the city's threatened "Brookline-Elm" area, where the Inner Belt was slated to remove approximately 1200 low to middle income dwellings.[70]

This part of Cambridge was highly diverse, to a degree that was somewhat rare in this era.[71] Gordon Fellman, a sociology professor at Brandeis University who closely studied the Cambridge freeway revolt, described the neighborhood as "unusually well integrated racially,"

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[69] Silver, the "Movement Movement." In yet another review of the book, Boris Pushkarev similarly suggested that the designers could have achieved their recommended route with a "more direct design approach": implying, as has been pointed out by Divya Rao Heffley, that it was perhaps not necessary to engage the authors' proposed process in order to achieve their proposed design. Boris Pushkarev, "Book Review: The View from the Road, by Donald Appleyard, Kevin Lynch, and John R. Meyer," *Journal of the American Planning Association* 31.3 (1965), 267; Heffley, *Vision in Motion*, 207-208.

[70] Keyes and Fellman, "Neighborhood Protest of An Urban Highway," 119.

[71] In its cultural and racial diversity, this neighborhood was somewhat similar to San Francisco's Haight-Ashbury neighborhood, discussed in Chapter Two.

noting that here, "'racial and ethnic harmony' appears to be a reality rather than a cliché."[72] As Fellman detailed, the Cambridge Committee provided residents with much-needed clout, bringing both expertise at reading official planning documents, and practiced abilities to "'speak the same language' as government officials."[73]

To prevent destruction of the Brookline-Elm neighborhood, the Cambridge Committee called first and foremost for a restudy of Boston-area transportation needs. They also encouraged consideration of an alternate route that would run alongside the edge of the MIT campus, rather than through Brookline-Elm. In 1966, Lynch, Appleyard, and Myer publicly endorsed this route, in an open letter written with three other members of the MIT planning faculty.[74] Noting that any freeway through Cambridge was concerning with regards to its destructive impact on local homes and institutions, the letter suggested that a route edging the MIT campus was at least "feasible," in that its damage to residential areas was far less than that of other possible routes. The writers acknowledged that this route would be problematic for the university with regards to impacts on existing structures, but argued that damage to existing residential communities was far more problematic than any difficulties that the university might incur.[75]

In endorsing this route, the VFTR team and colleagues directly opposed their university administration's position with regards to the Inner Belt location. According to several accounts, the administration had, in fact, privately convinced the DPW to avoid the MIT-adjacent route

[72] Keyes and Fellman detailed the area's inhabitants in one of their accounts of the protest: "in a sample of 120 families, 12 percent were Negro. Enclaves and scatterings of Portuguese, Puerto Rican, French Canadian, Italian, Irish, Greek, Lithuanian, and other nationalities - many of their members first and second generation - characterize the area." Keyes and Fellman, "Neighborhood Protest of An Urban Highway," 119.
[73] Op.cit., 120.
[74] The other faculty members were Bernard Frieden, Associate Professor, Philip Herr, Lecturer; and Stephen Carr, Instructor. Memorandum, Folder 11, Lynch Statement 1966, Box 77, MIT Planning Office, AC205 - Series III Library Files, MIT Institute Archives.
[75] Ibid.

several years earlier, thereby supporting by default the existing plan to route the freeway through the adjacent neighborhood. Indeed, shortly after the planning faculty letter, the administration's opposition was made more explicit: J.A. Stratton, the university's president, wrote a letter to the MIT community stating that the administration opposed this alternate route due to the degree to which it would damage MIT buildings and limit the university's landholdings.[76]

The following year, Lynch would contribute to another co-authored letter. This one was written by several MIT professors to the faculty at large, asking them to sign a petition demanding that the planning of all Inner Belt routes be put on hold until a thorough restudy of the Boston-area transportation plan was conducted. This letter, similar to one circulated among Harvard faculty, emphasized the problems of a Brookline-Elm route, and additionally argued that other routes' potential damage to university lands was equally unacceptable.[77] Later that year, the MIT Civil Rights Committee, MIT Civil Planning Students for Social Justice, and MIT chapter of Students for a Democratic Society co-wrote an open letter to new university president Howard Johnson, imploring him to support the MIT-adjacent route in order to spare residents threatened by the alternate route. The students appealed to the administration's ethics: writing, "it is painful to be regarded as representatives of an institution suspected of imperial designs on people who cannot defend themselves," and suggesting that if the administration supported the campus-adjacent route it would "mark a new era of social responsibility on the part of this

[76] Letter from President Stratton to the MIT Community, Folder 10, Inner Belt – Letter to MIT Community, 1966, Box 77, MIT Planning Office, AC205 - Series III Library Files, MIT Institute Archives.

[77] Stephen Carr also signed this letter: he was still a member of City and Regional Planning, now an Assistant Professor. Also signing were William Allis, Professor of Physics, and Everett Hagen, Professor of Economics. Letter, April 11, 1967, Box 73, Folder 4, Inner Belt - Air Rights Housing, 1967, 1966-1967, 1974, 1976. MIT Planning Office, AC205 - Series III Library Files

Institute."[78] From this point, debate over the Inner Belt continued for several more years still, until 1972, when the Cambridge portion of the Inner Belt was canceled completely.

All of this controversy took place several years after the publishing of VFTR. And yet there is a notable connection between the VFTR team's "theoretical" work and the controversies that followed later. The route proposed by Appleyard, Lynch, and Myer was, in fact, almost identical to the MIT-adjacent route that Lynch would later endorse against the administration's interests, and over which the MIT administration would be accused of early 1960s back-room deals with the DPW (Figure 3.13).

In light of this, Silver's suspicion takes on new depth. Was there, in fact, a surreptitious political position lurking in the VFTR proposal for Boston's Inner Belt, beneath the designers' purportedly experiential, technical, and methodological experiment? Even if the VFTR team wasn't aware that their university's administration was in private discussions with the DPW regarding this route in the early 1960s, it seems likely that the team at least considered potential loss of local residences as part of their proposed alteration of the Inner Belt's route through Cambridge. Are we really to believe that they selected their proposed route with complete innocence of local politics, purely on the basis of sensory potential identified through their innovative design method?[79]

[78] Open Letter to President Howard W. Johnson from the MIT Civil Rights Committee, MIT City Planning Students for Social Justice, and MIT Chapter, Students for a Better Society, Box 73, Folder 4, Inner Belt - Air Rights Housing, 1967, 1966-1967, 1974, 1976. MIT Planning Office, AC205 - Series III Library Files.

[79] Hashim Sarkis has remarked on Lynch's avoidance of political controversy in other areas, noting that despite the clear influence of James Gibson's psychological research on Lynch's work, he failed to reference Gibson in his published work once Gibson became a target of McCarthy-era attacks. Sarkis, "Disoriented: Kevin Lynch, Around 1960."

The archives do not yield any evidence that the VFTR team had surreptitious political motives.[80] Nor do they contain any process drawings demonstrating how the team progressed between their analysis maps and the final design proposal for the Inner Belt. At the very least, then, we find ourselves with a gap between the team's analysis and their final proposal. Did they imagine, test, and decide their proposed Inner Belt location through iterative drawing, as designers typically do? *Could* they do so by using the intricate series of analyses and projections that comprised their novel design process?[81]

It seems at least possible that the VFTR team's novel design approach did not in itself provide the necessary design tools for developing a design proposal. Indeed, it is difficult to imagine that their complex notations were flexible enough to effectively supplant typical uses of section, plan, and perspective drawings to evolve a design idea. If the diagramming of sensory experience did fall short as a design method, then other, invisible factors – political, practical, or otherwise – could easily have been incorporated into design decision-making outside of the proposed process. There certainly would be nothing wrong with that situation. However, if the proposed process did *not* effectively precipitate a location proposal, then why would the VFTR team propose to use it at all? What was the team's intent in promoting this method over, for example, a more socially nuanced approach, especially one that might more transparently incorporate their political leanings with regards to local controversies?

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[80] The text of VFTR offers no hints on the political ramifications of this route either. Regarding the portion of the recommended route that ran adjacent to MIT, the team wrote: "the stretch alongside M.I.T. is without strong incident, except for the local interest of the Institute buildings. This section simply follows the river at a distance of a few hundred yards and allows time for panoramic views of Cambridge and parts of the Crossing." Appleyard, Lynch, Myer, *The View from the Road*, 49.

[81] Divya Rao Heffley notes that Appleyard wrote a brief article in response to another critique, written by David Basch in the Harvard Graduate School of Design's publication, *Connections*. Curiously, Appleyard's primary defense of the VFTR approach was: "our system is not the only possible one, but we find it workable, we continually modify it, and we can design with it." Donald Appleyard, "Letters and Responses: Highway Aesthetics," *Connection* (Spring 1966), 7, accessed via Heffley, "Vision in Motion," 208-209.

The VFTR project, even as it evaded questions such as these, was exceedingly ambitious. Its goal to create an entirely new design language that could not only engage dynamic environmental complexity at massive urban scales, but also design for that condition as a matter of lived experience. No less ambitious, the impulse underlying this innovation was a universalizing one: borne of a desire to enable freeway riders to comprehend the holistic complexity of their city.

However, the political climate was quickly shifting beneath the VFTR team's feet. An experiential, driver-oriented approach likely seemed a more appropriate freeway design goal in 1958 than it did by the time the book was published in 1964, when freeway revolts had begun to take hold across the country. By that point, the sensory interests of this complex and nuanced project appeared politically naïve at best, and manipulative at worst. In this context, the VFTR team's very ambition to design an experience of urban whole was also the project's weakness. In the confrontational political climate of the mid-1960s, the very notion that an individual designer might dare to engage such complete perception was increasingly controversial. Viewed politically, visualizing a whole is a doomed effort: something or someone will always, by necessity, be left outside.

Conclusion

The View from the Road was an ambitious experiment in changing how designers drew and designed urban environments, and the freeway was a timely, productive catalyst for visualizing cities on interrelational terms. The novelty of seeing cities via the speed, elevation, and abstracted position of the car on the freeway reinforced the VFTR team's very conceptions of the city as a fundamentally dynamic interactive condition: part living, part built, composed of

material fluxes and flows. In this way, the freeway view likely made it easier for Appleyard, Lynch, and Myer to stretch their existing modernist notions of spatiality towards a broader understanding of the urban environment as a large-scale relational milieu.

Aware that their focus on driver experience was socially problematic, the team suggested that their project was more proof of concept than real-world proposal, and hinted that its narrowness was necessary for successful execution.[82] This may indeed have been the case. For even though the team selected a highly delimited subject matter and then progressively winnowed their source information, at the urban scale this highly narrow material nonetheless resulted in a series of exceedingly complex, proliferatively detailed visualizations. In this way, the VFTR project embodied an emerging, design-based, progressive environmentalism.

We should ask, however: what good is design innovation if it is unmoored from the social, economic, political, and material realities of its context? Given the complexity of their site, the designers were problematically exclusive in their choice of subject. Their approach to freeways elided the political dislocations, power asymmetries, environmental problems, and inequitable race/class dynamics underlying freeway construction. Their honed focus on the personal sensory experiences of drivers aestheticized these concerns, flattening them into visual effects. Even the designers' own opinions regarding local freeway politics – whatever they may have been at the time – were excluded from this new approach. In all these ways, the VFTR team resisted understanding design as political, and in doing so, either externalized or elided from essential aspects of how urban freeway politics increasingly worked.

[82] Regarding this "proof of concept," quality, as Appleyard and Lynch put it, the VFTR project was "above all… a trial of method." "Commentary on the Mystic Route," Kevin Lynch Collection, MIT Institute Archives.

This resistance was linked to a traditional notion of design expertise. Throughout the VFTR project, the team maintained a modernist belief that the designer's most essential role was a vanguard, culture-making one.[83] Despite gestures towards impartiality, they largely operated on the assumption that they knew how others should experience cities: they assumed that people wanted and needed to comprehend the city as a whole, and visualized the urban milieu in new ways so that others could see it as they did. Positioning themselves as culturally authoritative in these ways suggested that they believed they could – and perhaps should – sidestep political controversy in favor of an impartial position.

In the 1960s, however, the very possibility of an impartial position was rapidly disappearing. As Halprin would soon discover in the San Francisco case, residents threatened by freeways were unlikely to see designers as unbiased, no matter how surely designers saw themselves that way. In freeway conflicts, design work could easily be seen as a product of alliances, affiliations, and privilege-bound preferences. Therefore as 1960s urban controversies continued, there were fewer and fewer sidelines where a designer could stand; fewer and fewer ways designers could position themselves as culturally enlightened and politically neutral. As debates regarding urban and regional development became increasingly politicized, the very roles of designers began to shift and change as well.

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[83] Lynch often associated people's perception of urban wholeness with orientation, navigation, and a sense of safety, security, and comfort. And yet he tended to take this connection as a given, rather than questioning whether locals needed or desired to perceive the city as a whole. In contrast to this approach, one might consider the work of Jane Jacobs. In *The Death and Life of Great American Cities* she made some similar observations to Lynch in *Image of the City* regarding how people experienced and navigated urban space. Yet she did so through a much more particular, neighborhood-scale approach: spatial conditions were not interesting in their own right, but rather tightly linked with resident's tactics for communication and safety, and a big-picture image of the city as a whole did not figure into peoples' daily lives. This alternate reading of similar experiences illustrates that Lynch's assumptions regarding what locals wanted or needed were not exactly incontrovertible. Jane Jacobs, *The Death and Life of Great American Cities* (Vintage, 1961).

As we will see in Chapter Four, a more politically efficacious approach to freeway design was also emerging in the mid 1960s: one that would extend far beyond freeway design, and even initiate the development of a new sub-discipline regarding the "ecological" analysis, management, and design of land. As the decade continued, many designers would shift even further away from modernist futurism in which the designer played the role of cultural visionary and advocate, towards a more conservationist view in which change was to be defended against and expertise was projected on the basis of quantitative and technological savvy. In the coming years, the methods and techniques used in freeway controversies would become far more stratified, codified, and standardized than those innovated in *The View from the Road*, making this project appear in retrospect remarkably personal, even whimsical in its innocence of evolving freeway controversies.

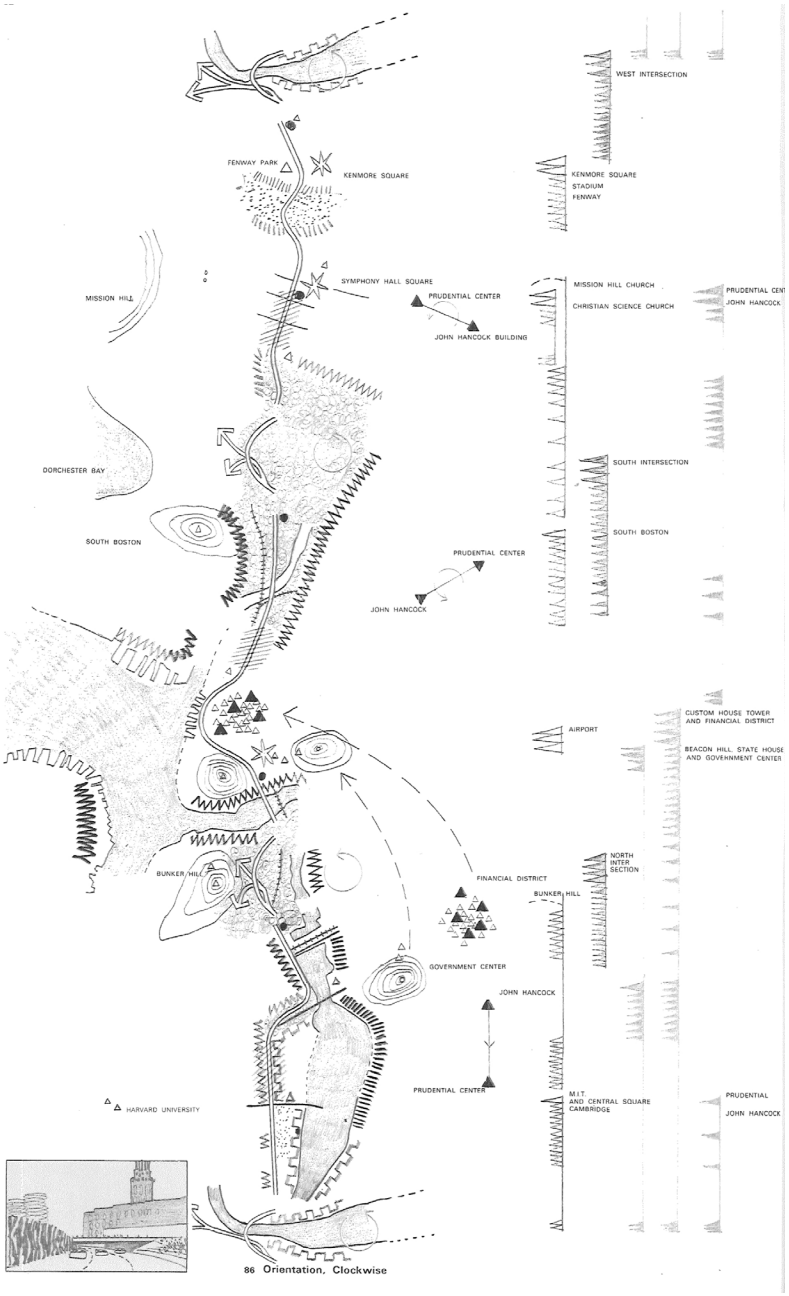


Figure 3.1. "Orientation, Clockwise," diagram of a proposed design for Boston's Inner Loop, showing the intended perceptual experiences with regards to orientation for people driving clockwise. Donald Appleyard, Kevin Lynch, and John Randolph Myer, *The View from the Road* (Cambridge: Published for the Joint Center for Urban Studies of the Massachusetts Institute of Technology and Harvard University by the M.I.T. Press, Massachusetts Institute of Technology, 1964), 52.

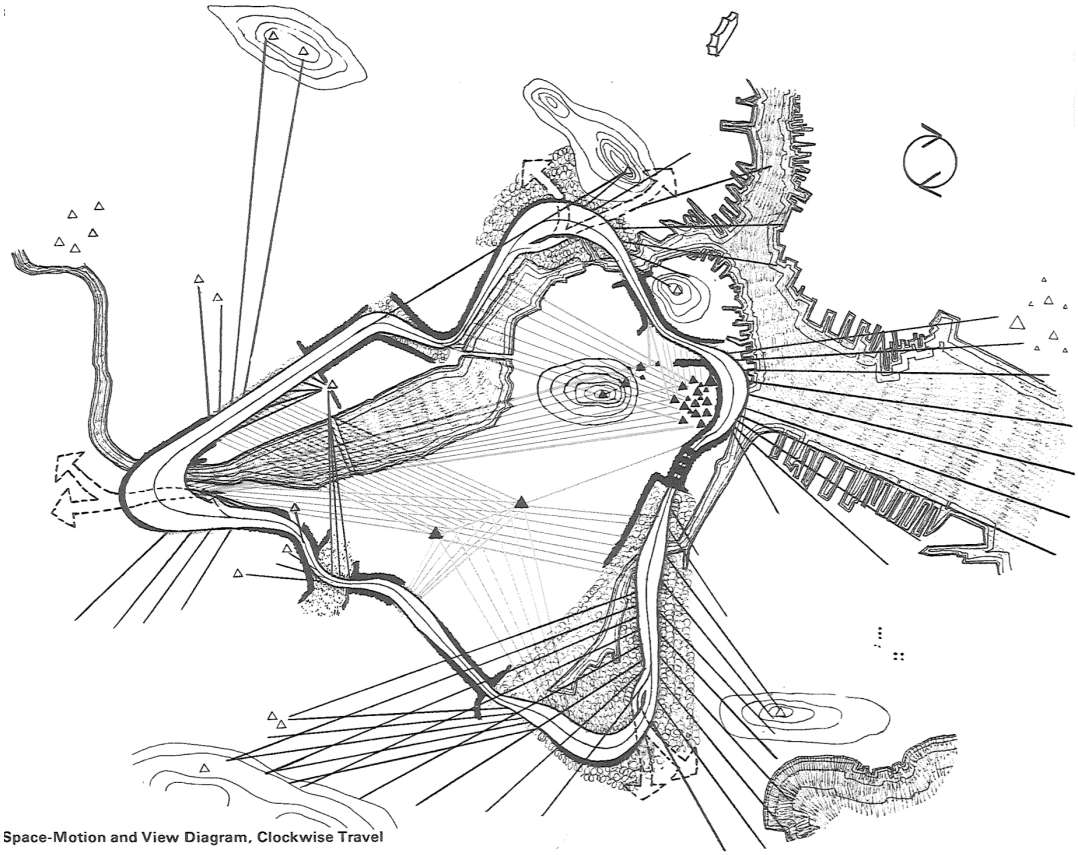


Figure 3.2. "Space-Motion and View Diagram, Clockwise Travel," plan diagram of a proposed design for Boston's Inner Loop, showing the intended perceptual experiences with regards to sense of motion and view for people driving clockwise. Appleyard, Lynch, and Myer, *The View from the Road*, 52.

Figure 5. Construction of Boston's Central Artery, 1956–1959.

Figure 3.3. Photograph of Boston's Central Artery under construction. Yanni K. Tsipis, *Boston's Central Artery* (Arcadia Publishing, 2001).

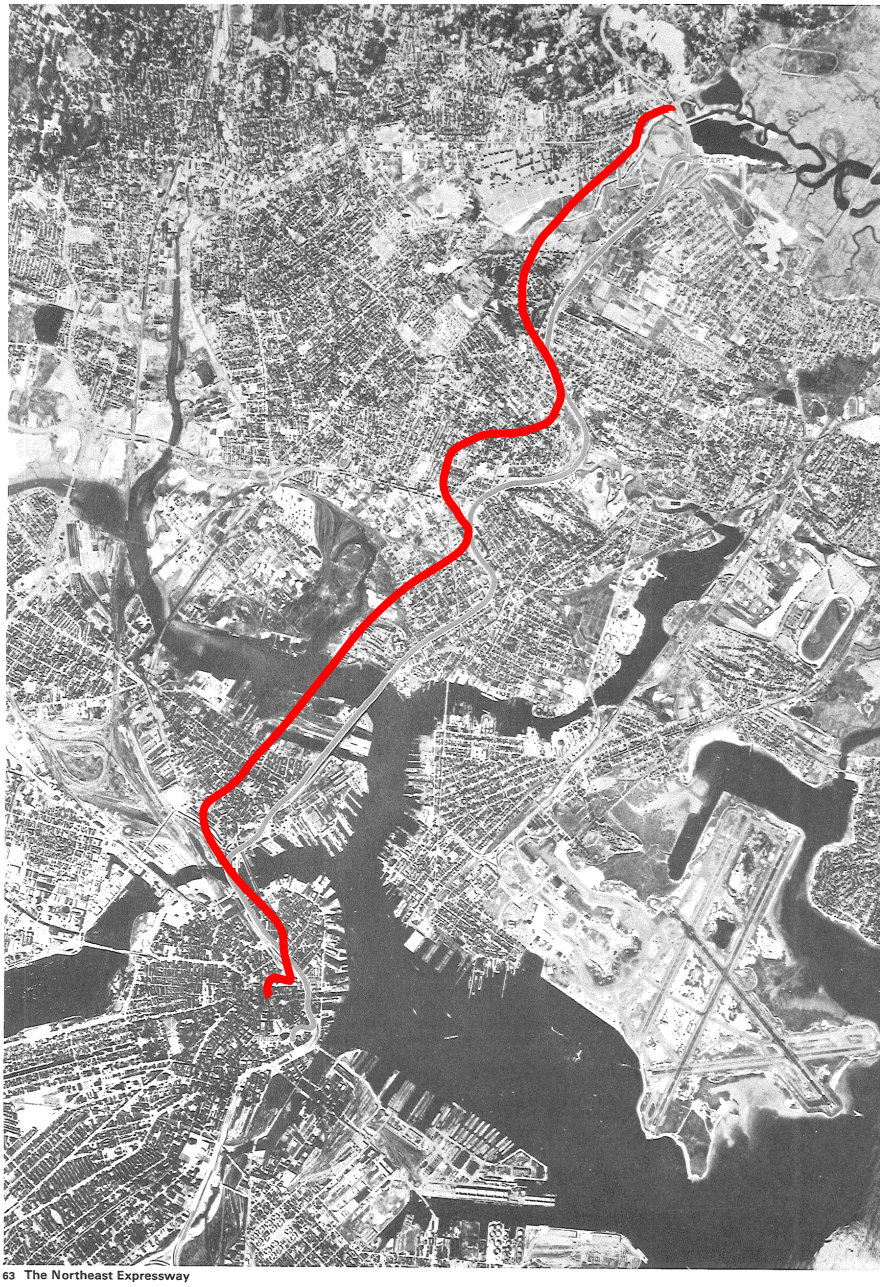


Figure 3.4. Map showing the Northeast Expressway route traveled by Appleyard and Lynch. Dashed red line added by author for clarity. Appleyard, Lynch, and Myer, *The View from the Road*, 26.

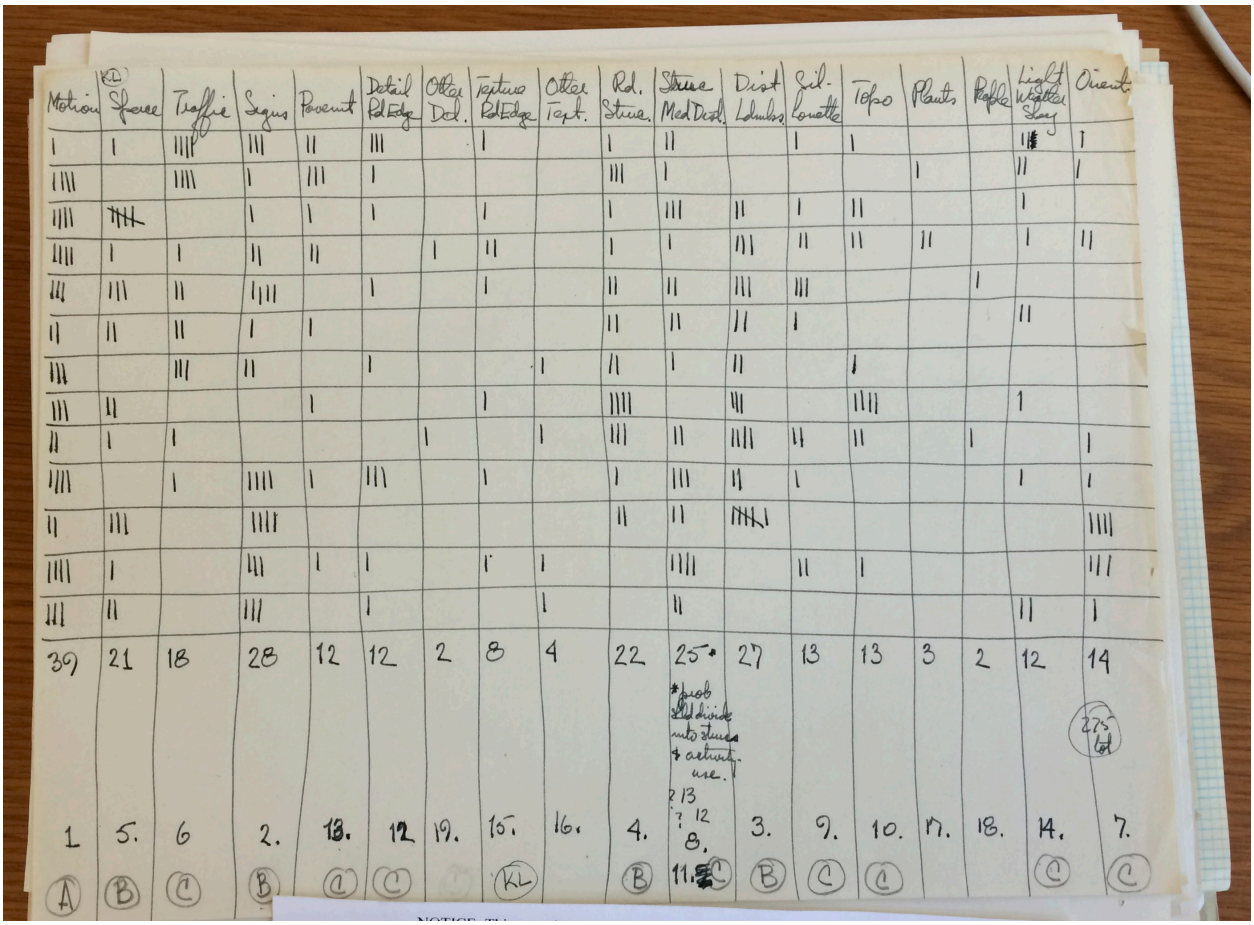


Figure 3.5. Chart showing the number of times that Lynch mentioned various types of urban views while riding the Northeast Expressway. Note totals and rankings of category frequencies at the bottom of the page: these are for both Lynch's observations and Appleyard's observations combined. Highway Notes, Kevin Lynch Papers, MIT Institute Archives.

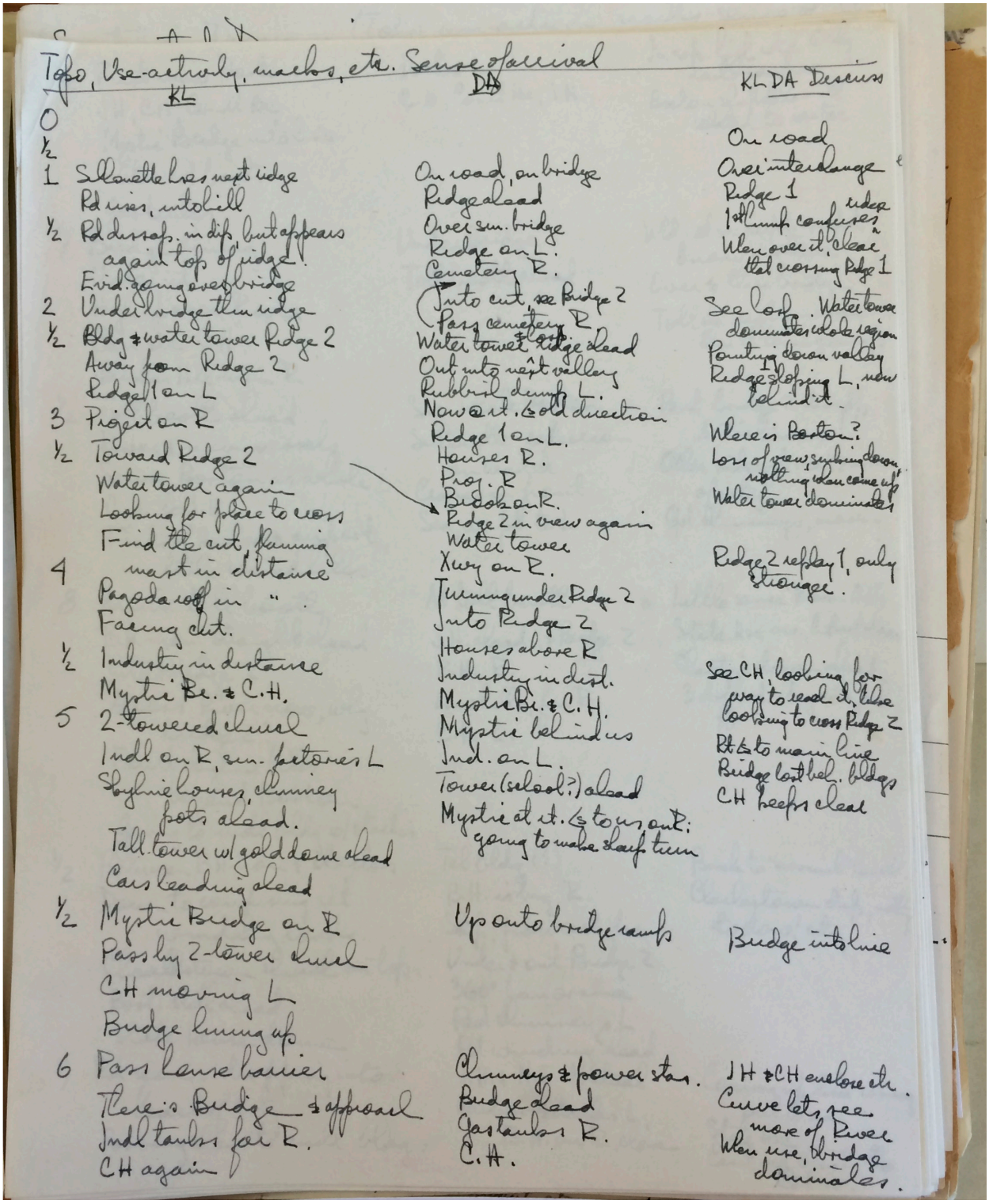


Figure 3.6. List showing the orientation-related observations (listed here as "topo, use-activity, marks, etc. Sense of arrival") of Lynch ("KL," left), Appleyard ("DA," center), and both ("KL DA discussion"), organized by the relative time of observation. Highway Notes, Kevin Lynch Papers, MIT Institute Archives.

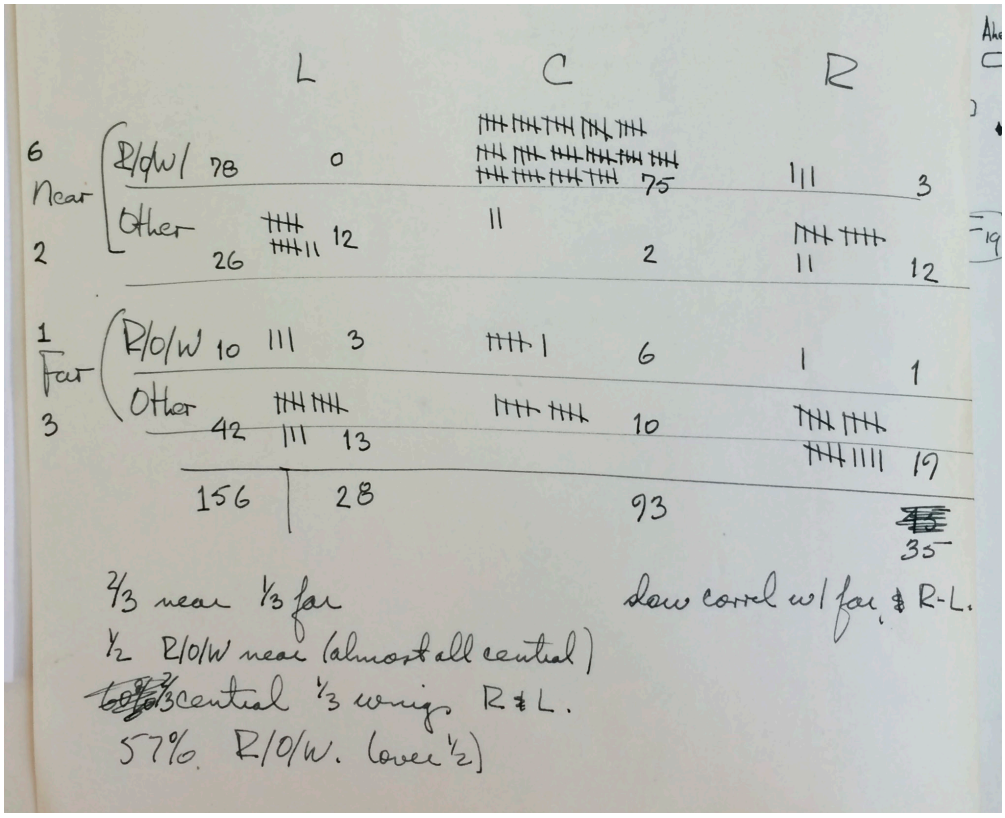


Figure 3.7. Tallies determining how many of Appleyard and Lynch's visual observations were near or far, in the right of way or not, and to the left, center, or right of the road. Note conclusion at the page bottom that over half of the observations concerned items in the road's right of way. Highway Notes, Kevin Lynch Papers, MIT Institute Archives.

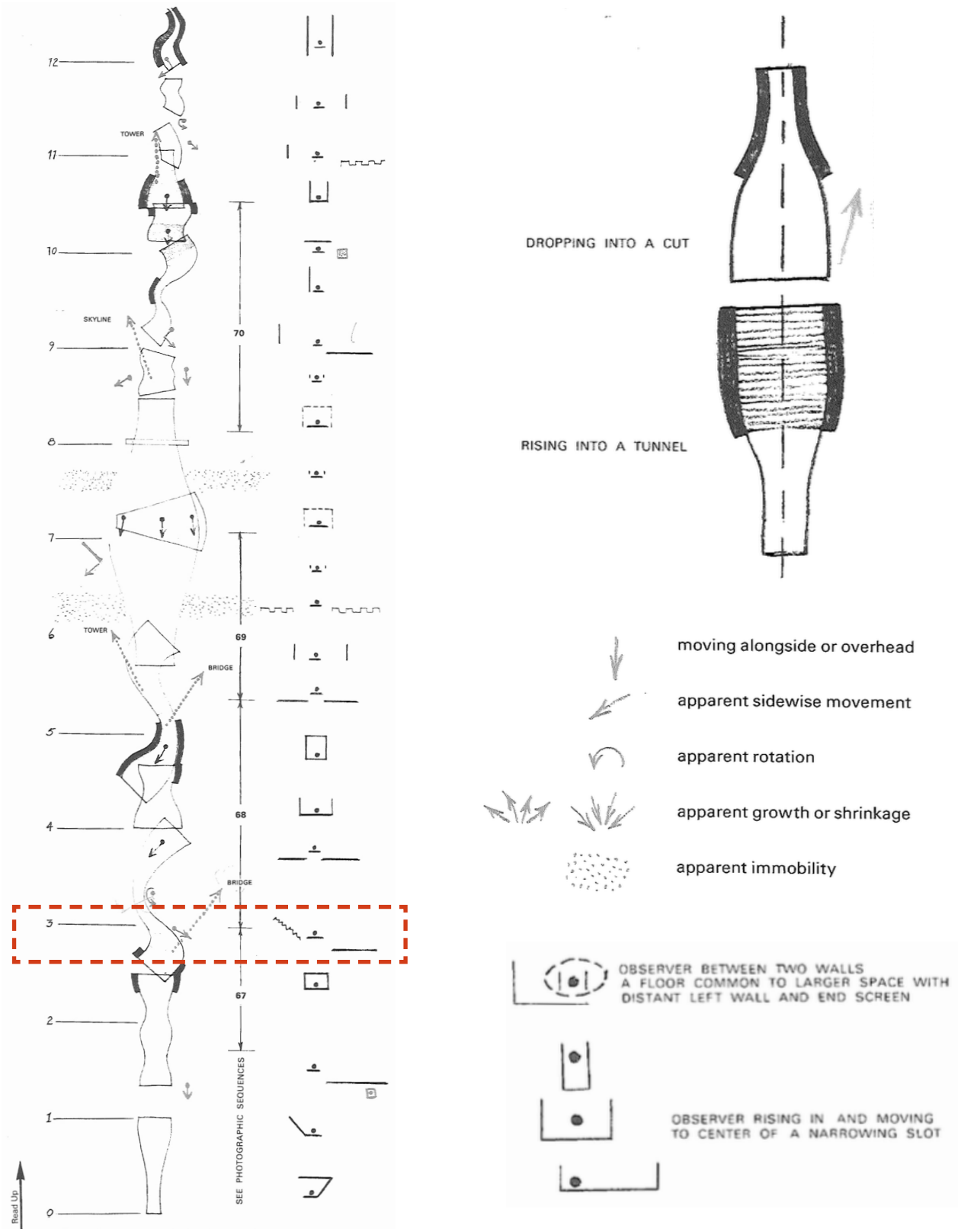


Figure 3.8. "Space Motion Diagram For Northeast Expressway" (left) and relevant symbol keys (right). Minute three outlined in dashed red line by author. Appleyard, Lynch, and Myer, *The View from the Road*, 22-23, 30.

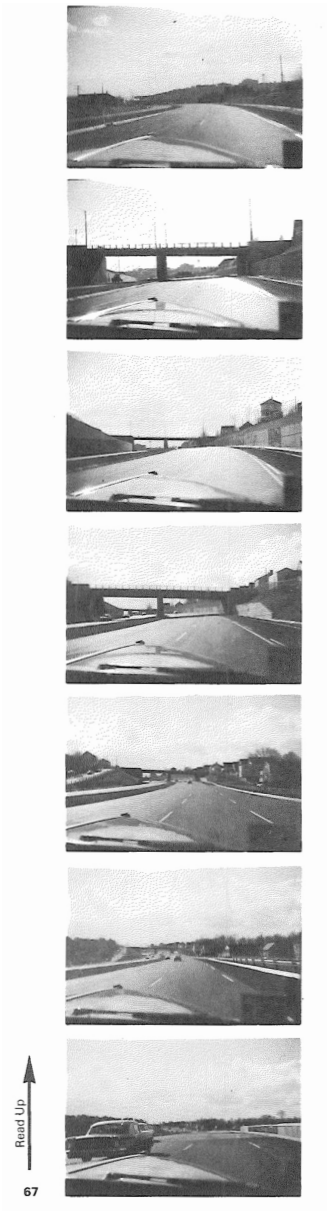


Figure 3.9. One of several photo sequences referenced in Figure 3.8, showing views from a car over the course of the driving the Northeast Expressway. Appleyard, Lynch, and Myer, *The View from the Road*, 32.

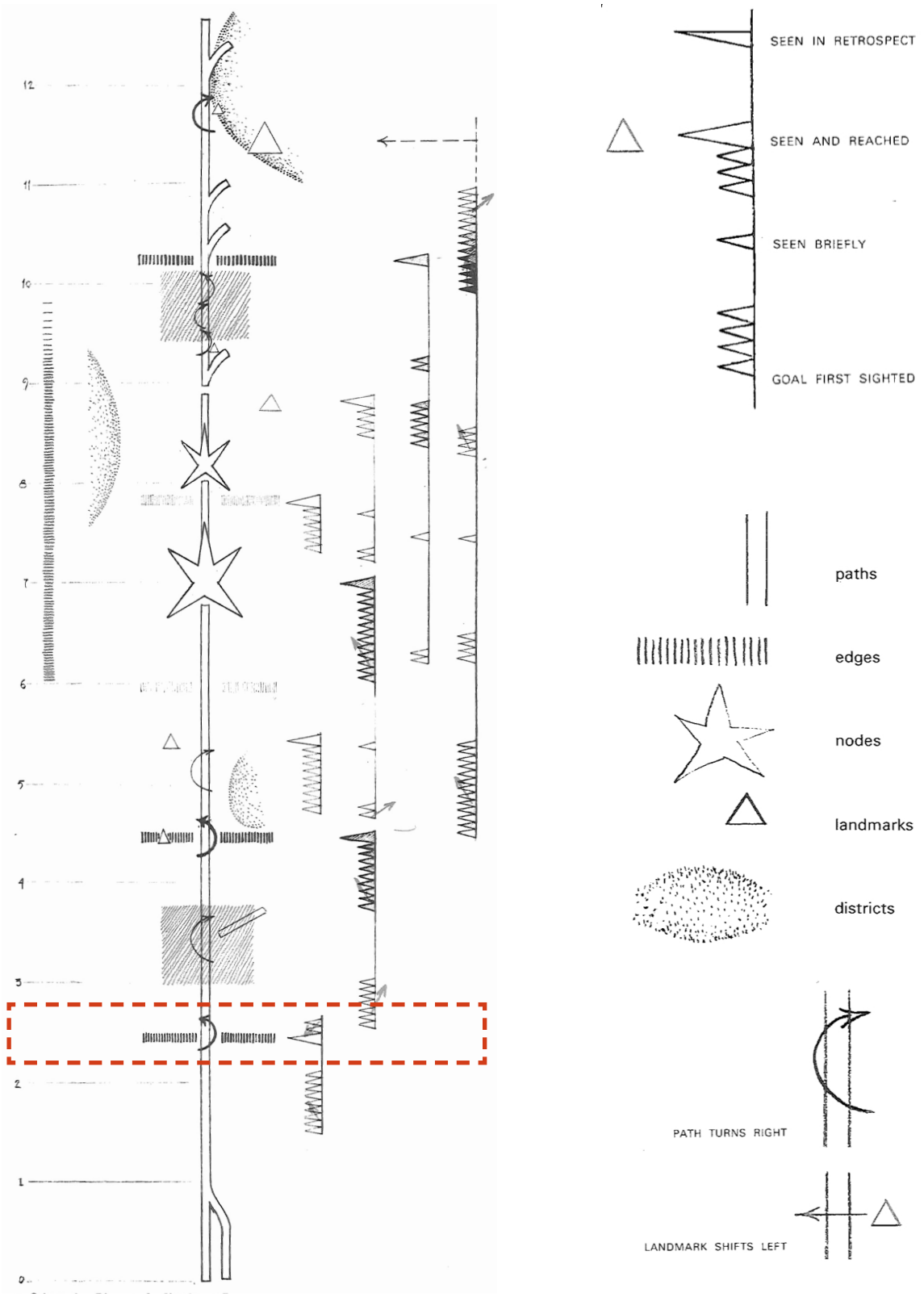
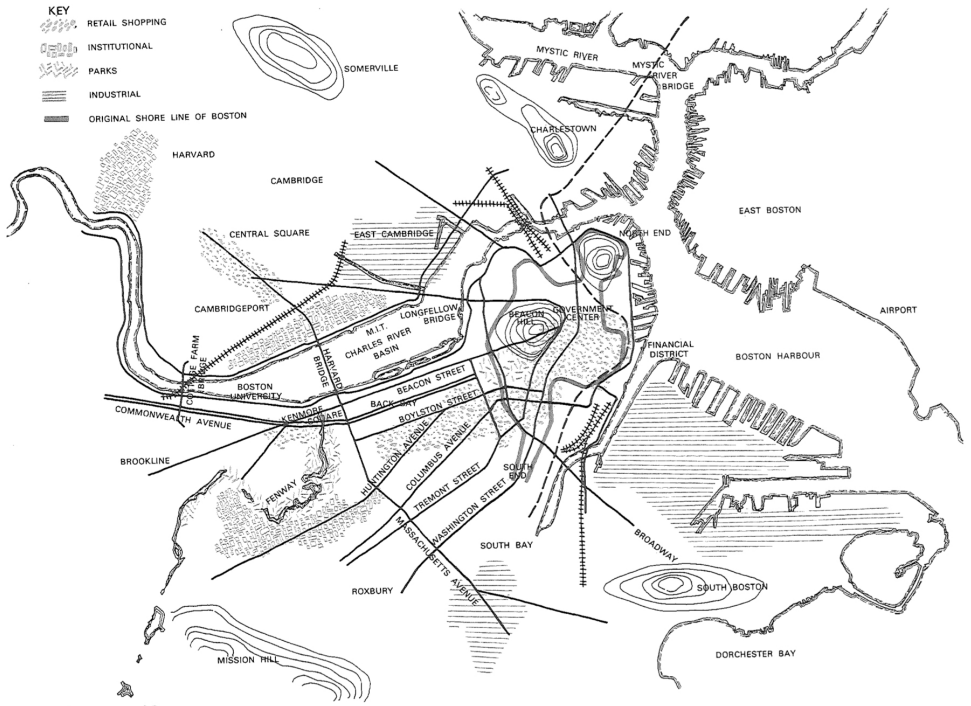


Figure 3.10. "Orientation Diagram for Northeast Expressway" (left) and relevant keys (right). Minute 2.5 outlined with red dashed line, by author. Appleyard, Lynch, and Myer, *The View from the Road*, 24-25, 31.



75 Map of Structure of Boston

76 Existing Image of Boston

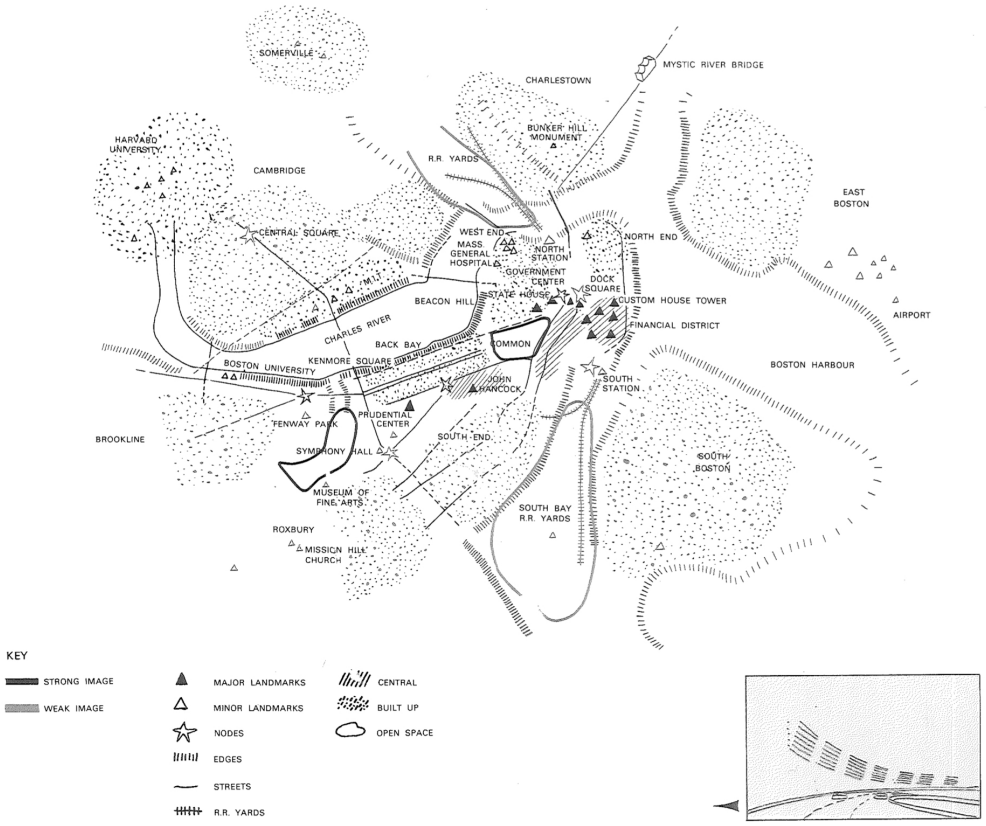


Figure 3.11. "Map of Structure of Boston" (top) and "Existing Image of Boston (bottom). Lower right image is part of a "flip book" series of images that runs throughout the book. Appleyard, Lynch, and Myer, *The View from the Road*, 41.

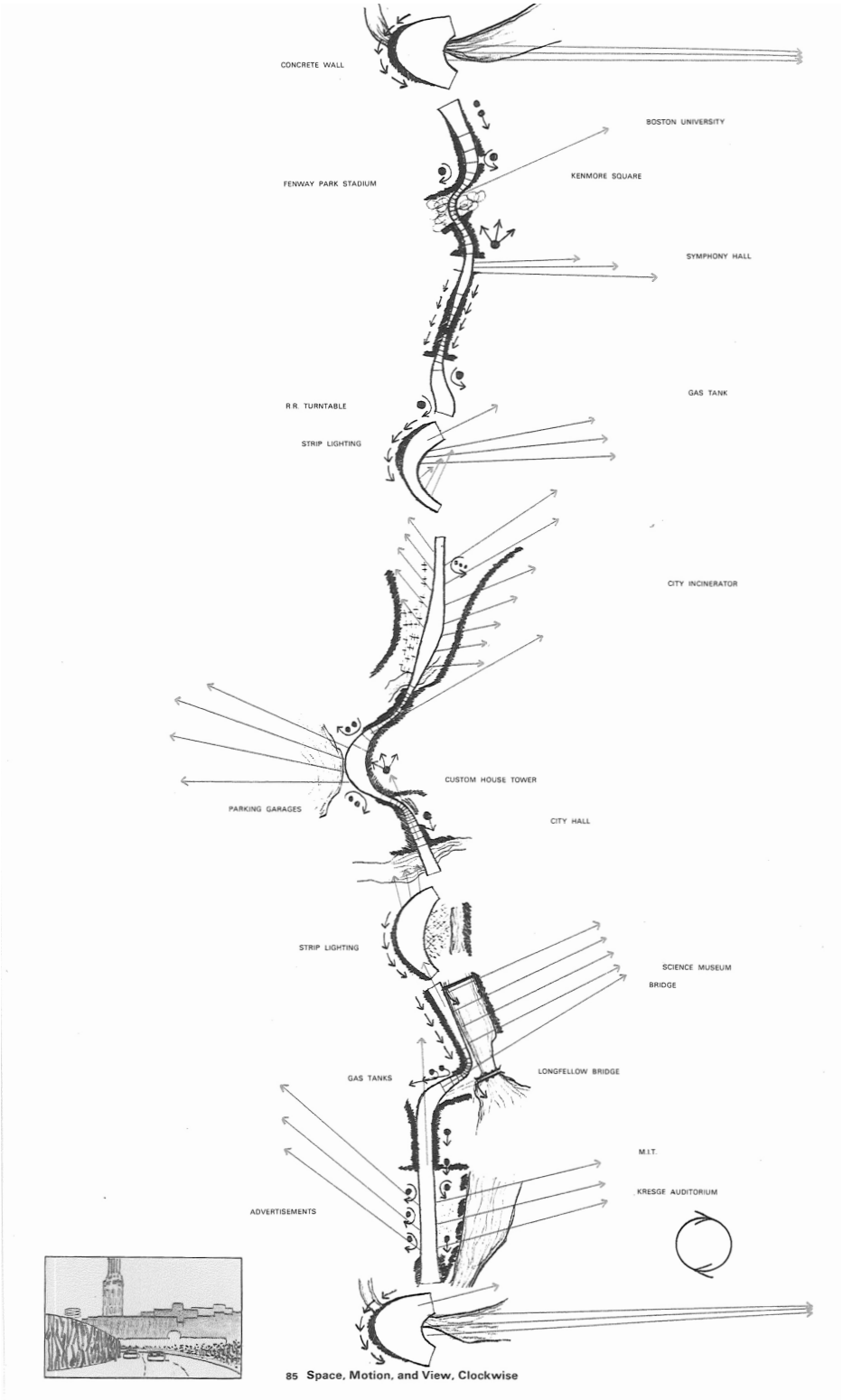


Figure 3.12. "Space, Motion, and View, Clockwise," diagram of a proposed design for Boston's Inner Loop, showing the intended perceptual experiences with regards to space, motion, and view for people driving clockwise. Lower left image is part of the "flip book" series of images that runs throughout the book. Appleyard, Lynch, and Myer, *The View from the Road*, 50.

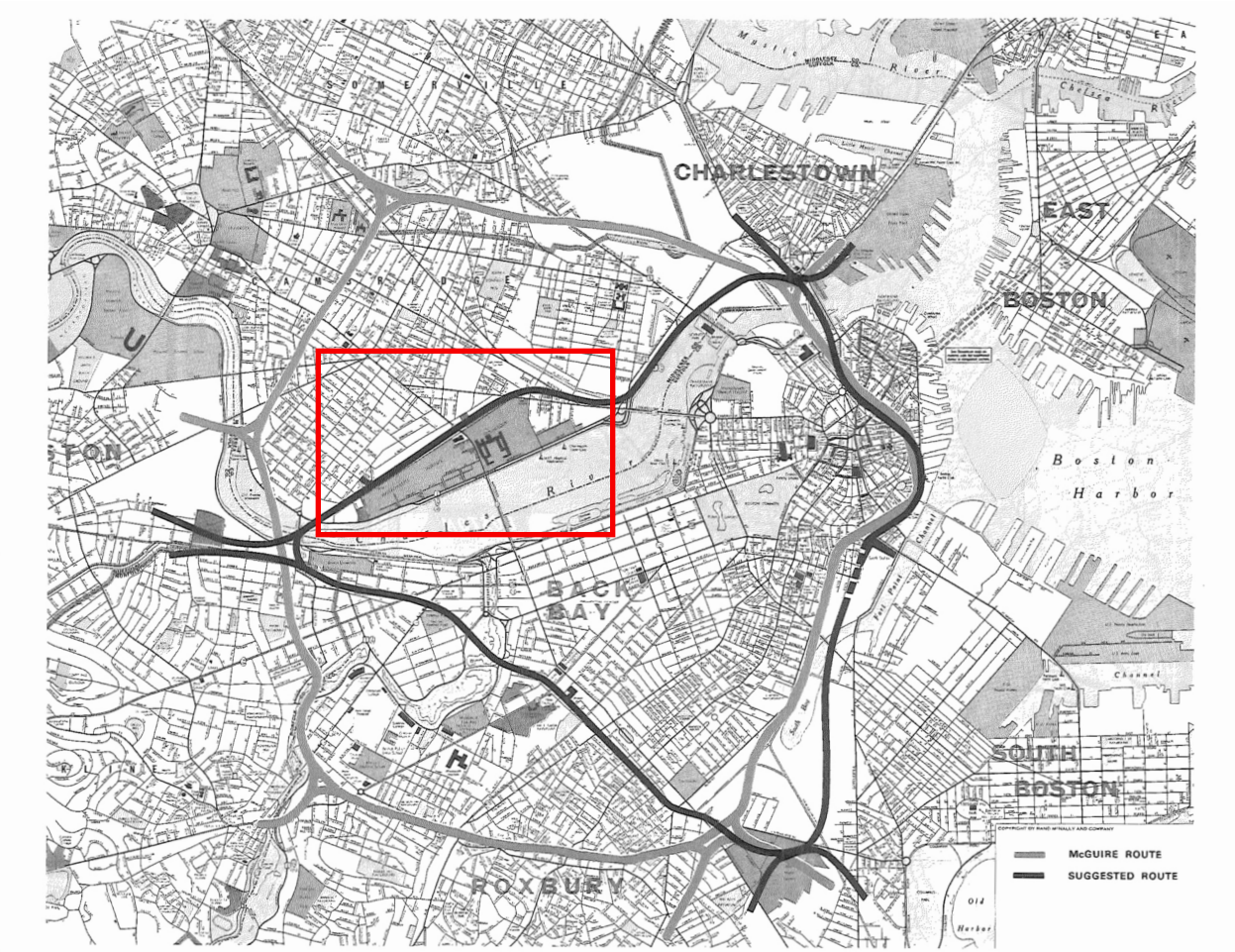


Figure 3.13. "Comparison of Proposed Route with Official Route" for Boston's Inner Belt. Official route is in gray, the proposed route is in black; the area marked in red (by the author) shows the recommended location (black line) immediately adjacent to the MIT campus (area south of the line in dark gray), thus avoiding travel through the Brookline-Elm neighborhood to the Northwest (gray route line, upper left). Appleyard, Lynch, and Myer, *The View from the Road*, 45.

CHAPTER FOUR

LANDSCAPES OF COST AND CONTRADICTION: HIGHWAY LOCATION AND THE RISE OF ENVIRONMENTAL PLANNING

The year is 1965. Two well-dressed, martini-sipping Princeton, NJ residents stand in a gallery before a work of abstract art composed of several curving and arcing intersecting lines (Figure 4.1). The viewers seem passively bemused by what they see. They are clearly uncertain how to read the abstraction before them, yet they appear unbothered by the confusion. They seem to have nothing at stake relative to the drawing they view: they are poised to browse, walk on, and forget. Glancing at the program, the woman explains: "this one's called 'Proposed Routes for I-95.'"[1]

Intended to connect eastern seaboard cities from Florida to Maine, the plans for Interstate 95 were highly contested at this moment. The highway's path had been designated in the mid-1950s by the federal government (Figure 4.2). From the late 1950s through the 1960s, as state highway departments unveiled plans for specific portions of the route, protests erupted in many of the cities the interstate would connect, including Boston, Baltimore, Washington, and Philadelphia.[2] Between New York City and Trenton, NJ, I-95 was to be routed through a bird sanctuary at the edge of Princeton Township: as such, was heavily protested in Princeton as well.

Compared to the freeway protesters discussed earlier in this dissertation, these imagined Princetonians demonstrate oddly sanguine attitudes regarding the highway threat. Fictional as they may be, their ease points to the significant role of race and class in residents' confidence

[1] "This One's Called Proposed Routes for I-95," *Town Topics*, March 17, 1966, 1.
[2] By 1970, a New York Times article on I-95 resistance would refer to the route, with its many unbuilt fragments, as a "mortally wounded snake." Donald Janson, "Expressway Construction Lags As Officials Heed Urban Outcry," *The New York* Times, Feb 15, 1970.

that they could prevail in the face of highway plans.[3] And prevail they would: the portion of I-95 that they resisted would never be built. There is, however, another notable aspect of the indifference on display here, regarding the work of art itself. These viewers appear in no way concerned about the fact that they cannot make sense of the highway drawings in front of them. The plans are inscrutable, and apparently that is as it should be – or at the very least, it is nothing to worry over. In light of this indifference, one might ask: what *was* the role of imagery in the Princeton I-95 controversy? Were route drawings visions of alternate futures? Sources of information? Political tools? And, did protestors need to understand freeway proposal maps in order to deploy them, or was such understanding politically inessential?

This chapter delves into the significance of drawings such as these in late-1960s highway proposals and related political controversies, by tracking the development of a "highway location" approach through three projects that took place from the late 1950s through the mid 1960s. The first was a 1957 highway location method proposed by Massachusetts Institute of Technology (MIT) civil engineering professor Paul O. Roberts, as part of his graduate thesis. The second was a theoretical 1963 diagram-based adaptation of Roberts' approach conducted by Christopher Alexander and Marvin Manheim, then graduate students at the Harvard Graduate School of Design (GSD) and MIT's civil engineering department, respectively. The third constituted the first public application of this method: a 1965 study commissioned by the Princeton citizen-driven Delaware-Raritan Committee on I-95 and led by Ian McHarg, head of the landscape architecture department at University of Pennsylvania and partner in design and planning firm Wallace, McHarg, Roberts, and Todd.

[3] It should be noted that, in contrast to the attitude on display here, many Princeton citizens were concerned about what would happen with I-95: in the various articles published in *Town Topics*, even in the article directly alongside this comic, the freeway controversy is treated as important and urgent. *Town Topics*, March 17, 1966, 1.

Unlike the freeway designs discussed in this dissertation's other chapters, these works were not located within cities. They were, however, relevant to urban freeway debates in several ways. First, in the 1960s, Princeton residents saw themselves as part of the eastern seaboard's extensively networked urbanization; as such, they adopted protest tactics that were in line with, and showed awareness of, freeway revolts occurring in larger cities at the time. Second, as will be demonstrated in Chapter Five, the highway location projects analyzed here would quickly become part of discourse regarding urban freeway design. Lastly, these projects would form the basis for new planning approaches that would be used to control suburban development. For these reasons, the highway studies discussed here contributed to freeway debates and designs occurring in other U.S. cities in the 1960s.

Towards an understanding of the highway location method's broader political and disciplinary ramifications, this chapter closely examines its migration and evolution: as it emerged in highway engineering as a tool for determining the most cost-effective highway locations, entered design discourse through an experimental collaboration between an engineer and an architect, and then became entwined, through real-world application, with environmental approaches to landscape management. From there, it would go on to have a long trajectory within the design and planning professions: becoming a methodological underpinning for an emerging field of environmental planning, and forming a key element of Geographic Information Systems (GIS) and other computer-based approaches to resource and land analysis, allocation, and protection – approaches whose use has grown and become standard since the 1970s.

All three of these projects reflected the rapid technological advancement and growing bureaucratization of land management in the 1960s: in varying ways, and to different ends. Roberts' economic, computational approach reflected the era's anticipation of more advanced

computerization; its expanded roles for engineers in highway design and land planning; and its increase in government-driven, standardized, technical approaches to highway design. The design-based modifications of Roberts' project, meanwhile, reflected 1960s designers' anxieties regarding the fact that they had lost significant roles in highway projects, despite the fact these large-scale infrastructural works directly impacted the planning and organization of cities and regions. Accordingly, we see two prevalent, contradictory tendencies at play here with regards to disciplinary relationships between engineers and designers. On one hand, we see designers borrowing technical expertise from engineers; on the other, we find them defending their own authority in the face of a broad movement away from recognizing the uniquely qualitative, experiential aspects of their expertise.

In this vein, the Alexander/Manheim and McHarg projects not only adopted Roberts' method, but also adapted and criticized it. In adopting Roberts' computational logic, Alexander and Manheim and then McHarg would essentially translate his approach for design use, after which it would become a key methodological building block for environmental planning approaches that were rapidly developing at this time. Furthermore, McHarg's team would find the governmental underpinnings, computational logic, and apparent objectivity of Roberts' method strategically useful as they deployed the approach in public forums and governmental contexts. As for the design teams' adaptations and criticisms, they largely involved introducing qualitative aspects to Roberts' primarily quantitative approach.

It is not difficult to see why, in this period of contentious negotiation between freeway protestors and government highway divisions, designers seeking to impact engineer-controlled highway planning would see strategic value in the technical precision and computational clarity of Roberts' method. However, the efficacies of the qualitative aspects that the

Alexander/Manheim and McHarg teams each introduced to that method are less obvious. Why and how did these designers introduce immeasurable qualities into Roberts' method, and what were the effects of such incorporations? The answer to these questions lies in numerous small moves that both teams deployed, through language, technique and method, throughout their highway location work. To track these moves, I introduce Roberts' proposed method as a precedent, and then delve more intensively into the adoptions and adaptations made in the two later projects. Of particular interest here are these design projects' characterizations of the cost value of land, the underlying sources of their data, the ways in which they incorporated quantitative logic into design method, the different values that each project placed on efficiency and accuracy, and the techniques that they used to abstract and simplify their visualizations.

Analyzing these various aspects of the Alexander/Manheim and McHarg projects reveals that as they integrated some engineering-based attitudes and logics into design practice and countered or resisted others, both projects manifested various contradictions in terms of how they characterized highway landscapes, and enacted their designing encounters with the natural forces within those landscapes.[4] While the designers made efforts to adopt newly technical, data-oriented, and fundamentally computational processes, they also made Roberts' quantified categories unstable: introducing uncertain, aesthetic, and performative drawing and making techniques that integrated unquantifiability and uncertainty into their approaches and representations. For Alexander and Manheim, this integration would serve to promote a cultural, holistic understanding of highway environments. For McHarg's team, it would be politically effective. By incorporating quantitative logic into design method while rhetorically resisting and tacitly complicating that logic, the McHarg team would create productive instabilities that

[4] In these projects, the "natural forces" I refer to were relatively large-scale phenomena, for example weather, geology, topography, water bodies, and plant communities.

enabled new political strategy within design process, and made environmental issues more actionable within governmental contexts. In this way, the very contradictions of these design approaches would open up new trajectories in design: for newly hybrid sites, at larger scales, with emerging technologies, and as part of a growing environmental movement.

"Using New Methods in Highway Location"

In 1957 Paul O. Roberts, recent graduate student and new professor in MIT's Department of Civil and Sanitary Engineering, outlined a new method for determining the optimal location of a highway within a region.[5] Existing highway location practices, Roberts argued, had two main problems: first, they failed to consider the full breadth of possible locations; second, they did not take into account all the parameters likely to influence the cost of construction. To solve for these issues, Roberts proposed a method through which engineers could efficiently quantify numerous variables at once, for all possible routes within a given region.

Roberts' hypothetical method combined computer-based calculation with photogrammetry and airphoto analysis.[6] He proposed compiling a diverse collection of source data, including land cost, soil conditions, hydrologic conditions (including drainage and stream crossings), earthwork,

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[5] In the same year Roberts detailed this method in his MIT Master's thesis and outlined it in a brief article. Paul O. Roberts, Thesis, "An Integrated System of Highway Location Analysis Using and Electronic Computers," Massachusetts Institute of Technology, 1957; Paul O. Roberts, "Using New Methods in Highway Location," *Photogrammetric Engineering* 23:3 (1957), 563-569.

[6] Photogrammetry and airphoto analysis were both techniques commonly used at this time for reading of aerial photos in order to derive terrestrial information, often for use in making maps. Photogrammetry is more quantitative and precise, in that it is a practice of obtaining accurate measurements from photography. Airphoto analysis is more qualitative, in that it involves using aerial photos in order to identify objects and judge their significance. Regarding use of these techniques in highway location, see William F. Childs, "The Use of Aerial Photography in Highway Location and Fixing of Quantities," *American Highways* 32.3 (1953), 6, 21–22. Regarding their use in planning, see Melville C. Branch, *Aerial Photography in Urban Planning and Research* (Harvard University Press, 1948). For a discussion of specific techniques, see Donald J. Belcher, "The Five Facets of Aerial Photography," *Photogrammetric Engineering* (1953), 746–752.

traffic desire, and "other variables" such as land use, weather, and the need to relocate existing utilities. In order to make these diverse characteristics comparable, the engineer was to convert all geographic data into maps of monetary units, and then add together all the maps to calculate the total cost of building a highway for every location within a region.[7]

In some ways, this approach reinforced methods that highway engineers already used at the time; in other ways it forged new ground. Highway engineers did typically take into account several of the variables that Roberts listed, commonly referencing parameters such as construction expenses, traffic volume, route efficiency, and safety. They also did use mapped statistical analyses, calculate highway construction cost, and reference it as the primary factor for location. Unlike Roberts' approach, however, engineers at the time did not analyze influencing factors in a comprehensive manner. They did not, for example, convert all relevant variables into a composite metric, or combine them into one map. Roberts' universalization of cost as the central unit for highway planning and his generation of a single map representing that cost: both of these steps were new.

The first part of Roberts' method involved compiling a wide range of plan-based data regarding the area under consideration: collecting aerial photographs, maps, and other relevant information from public institutions and private companies. Next, the engineer would create an air photo mosaic: overlapping individual photographs to assemble a broad aerial view of the relevant area. They would then trace the selected data for each given factor onto separate maps: laying transparent celluloid over the air photos and using a grease pencil to delineate areas of

[7] Costs in this case were essentially right of way costs and construction costs. Roberts, "An Integrated System of Highway Location Analysis Using Photogrammetry and Electronic Computers," 13.

different costs (Figure 4.3).[8] From here they would translate the mapped information into computable form: using a grid consistent to all maps, they would punch computer cards for each variable, marking the relevant value for each grid location. The cards would be loaded into a computer to calculate the summed values for each point, generating a series of computed bands of data listing the total cost for each grid row (Figure 4.4 illustrates this sequence).

The next step was to visualize the computed cost data as a map. Since computers were not yet capable of plan renderings, this was done by hand.[9] After translating total cost data from punch-card bands back into gridded plan form, the engineer would either visualize the values as an economic relief model, in which model elevation represented highway cost (Figure 4.5); or they could convert the values into a gradient of gridded tones representing various ranges of cost (Figure 4.6).[10] With a visual depiction of the data in-hand, the final step was to connect the lowest cost points to mark the least expensive highway route or routes, thereby determining the optimal highway location. In a relief model the lowest cost points would be the lowest areas; in a tone-gradient map they would be the lightest ones.

Four particular aspects of Roberts' method demonstrate how he understood the actions of computing, drawing, and viewing land, thereby offering a baseline reference for the Alexander/Manheim and McHarg teams' later adaptations. First among these was the central action of Roberts' method: computing cost. Roberts translated geographic data into economic values, used computation to integrate those values into dollar amounts, and then converted those

[8] Roberts, "An Integrated System of Highway Location Analysis Using Photogrammetry and Electronic Computers," 17.
[9] Roberts discussed this limitation in his thesis. Op.cit.,73.
[10] In his thesis Roberts imagined ways that a computer could be used to generate portions of the models, such as plotting each band of numbers in relief so that the engineer could then create a section-based relief model by stacking all bands and filling them in with clay. Roberts, "An Integrated System of Highway Location Analysis Using Photogrammetry and Electronic Computers," 72-74.

values back into visual form. Highway location was thus determined according to a purely economic analysis. Furthermore, the highway's potential site was reconstituted as a literal datascape: a topography of cost.

Second, the site map generated through Roberts' method appeared deceptively simple: highly distilled, it nonetheless relied on an extensive governmental apparatus of image collection and map production. Underlying Roberts' conversions and calculations was a broad network of federal aerial mapping initiatives that supported both highway engineering and urban planning in the postwar years.[11] The U.S. military had advanced the use of aerial photography by using it extensively in both world wars. The United States Geological Survey (USGS) increasingly used aerial-based mapping after World War I, developing methods for determining locations of built elements, as well as topographic, soil, and geological conditions.[12] By the early 1950s, photogrammetry was regularly used by urban planners and by several federal agencies, including

[11] Roberts' thesis represented a unique period in which engineers were unusually involved in geography and cartography. As U.S. defense strategies, highway planning, and suburban development rapidly accelerated in the postwar years, highway engineers, the U.S. Army, River Basin management bodies, and State Governors all found themselves in urgent need of detailed and accurate topographic maps. By 1952, "more than half" of the country was documented in USGS topographic maps, many of which were of problematically low resolution, and fifty years out-of-date with regards to land use and development. Soil and groundwater maps were only occasionally available, via the USGS, geography departments of nearby universities, or the Army Corps of Engineers. Given these limits, highway engineers often used photogrammetry and airphoto analysis to derive geographic data from aerial photographs. The need for highway engineers to generate their own maps would ultimately last only a few years; in the meantime, highway engineers were unusually closely involved in geographic analyses and issues. Colonel John G Lado et.al., "Gearing the Federal Mapping Program to the Highway Needs of the Nation," *American Highways* 4.31 (1952), 17-21; Childs, "The Use of Aerial Photography in Highway Location and Fixing of Quantities."

[12] Immediately after WWI, the USGS began analyzing series of U.S. Air Service photos to delineate building edges, vegetation types, and road locations, supplementing that analysis with traditional field survey methods to determine site topography. Photogrammetric mapping methods and airphoto analysis were used by other government agencies as well: The Tennessee Valley Authority generated a series of photogrammetry-derived maps for analysis and development, and airphoto analysis was a common technique for military reconnaissance in WWII. The United States was one of many countries developing such capabilities during the war. Regarding comparable developments in France, see Jeanne Haffner, *The View From Above: The Science of Social Space* (MIT Press, 2013). Morris M. Thompson, *Development of Photogrammetry in the U.S. Geological Survey* (US Geological Survey, 1952), 1-2.

the USGS Topographic Division, Coast and Geodetic Survey, Army Map Service, and the Forest Service.[13] Whether through aerial photos or technical maps, Roberts drew on this multi-division, federal apparatus of production for the majority of his factor data.[14]

Third, Roberts developed a computational approach to defining land in *anticipation* of upcoming technological advancements; using hand drawing to generate maps that he expected would soon be made digitally instead.[15] His highway location method was devised in a period of rapid postwar technological transition, as military wartime research was increasingly adapted for commercial and public uses.[16] Although computers could not process data in two-dimensional spatial fields in the 1950s, that capacity was anticipated.[17] In his thesis, Roberts hand-drew his

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[13] Photogrammetry and airphoto analysis were increasingly valued as cost-saving and efficient techniques for producing maps, because they significantly reduced the labor of field surveys. The U.S. Forest Service often analyzed aerial photos in order to classify stands of trees; landscape architects increasingly used these identification practices as well. Lado et.al., "Gearing the Federal Mapping Program to the Highway Needs of the Nation"; Reginald D. Forbes and Arthur B. Meyer, *Forestry Handbook* (The Ronald Press Company, 1955), 19:16-17. Regarding the use of photogrammetry in urban planning at this time, see, for example, Melville C. Branch, *City Planning and Aerial Information* (Cambridge: Harvard University Press, 1948). For more on Branch see Sonja Dümpelmann, *Flights of Imagination: Aviation, Landscape, Design*, University of Virginia Press (2014), 216.

[14] For more on the history of aerial photography, both innovations and their uses in design, see Dümpelmann, *Flights of Imagination;* Haffner, *The View From Above*"; Charles Waldheim, "Aerial Representation and the Recovery of Landscape," in *Recovering Landscape. Essays in Contemporary Landscape Architecture,* ed. James Corner (New York: Princeton Architectural Press, 1999), 121-139.

[15] This pairing of anticipated computer use with traditional hand-drawing techniques would be at play in Alexander and Manheim's and McHarg's later projects as well. On the anticipatory and often 'pseudo-scientific' character of computer-inspired design during this period, see Keller, "Fenland Tech," 59-60.

[16] The postwar extension of wartime military research and related evolution of computerization is a vast and fascinating topic in its own right. See Paul Edwards, *The Closed World* (The MIT Press, 1997).

[17] Scholars would not significantly begin exploring computer-based geographic visualization until the early 1960s – and then it was in theory, as computer technology was not yet sufficient for graphic production. Such ideas were being developed in several places at once during this period; among designers and planners, Professor Edgar Horwood at University of Washington is credited with one of the earliest projections regarding how computer mapping might be used for land analysis. The first design-based computerized mapping in the United States would begin in the mid-1960s, at the Harvard Laboratory for Computer Graphics and Spatial Analysis, which was launched in 1965. This program involved creative use of dot-matrix printers to generate symbol-based representations. J. Terry Coppock and David W. Rhind, "The History of GIS," *Geographical Information Systems: Principles and Applications* 1.1 (1991), 21–43; Carl Steinitz, "The Beginnings of Geographical Information Systems: A Personal Historical Perspective," *Planning Perspectives* 29.2 (2014), 239–254.

maps and also suggested some of the ways that computers might perform this step in coming years.[18] The promise of future computing was an inspiration for Roberts' new techniques.

Fourth, regarding the actions of drawing and viewing, Roberts prioritized efficiency and accuracy. Consistent with his profession, he understood highway location as a technical problem, and treated drawing as a mechanical task for precisely determining a mathematically defined solution.[19] This perspective was most apparent when he described an alternative analog version of his proposed method. In that version, the engineer could collage each individual analysis map by cutting the shape of each cost area out of different gray tone filter and affixing those filters to celluloid, using a tonal gradient similar to the one used to represent the final cost values in Figure 4.6. In this variation, it would not be necessary to mathematically compute total cost per point. Data would still be compiled into several analysis maps, but the computation of total values would be visual: degree of cost would accumulate through depth of tone, resulting in dark high-cost areas and light low-cost areas.[20] After considering this option, Roberts concluded that it was not preferable to the digital, mathematical approach. Manually cutting and applying filters was time-consuming, and it would be difficult to calibrate one's use of filters to the degree that one could get a precise read of total costs. For Roberts then, manual methods were evaluated purely on the basis of efficiency and accuracy – or, in this case, a lack thereof.

As with drawing, Roberts also engaged viewing as primarily a technical activity. For aerial image analysis, he proposed using what was then the most cost-effective and common tool for

[18] Roberts, "An Integrated System of Highway Location Analysis Using Photogrammetry and Electronic Computers," 12, 41-42.
[19] When Roberts did mention social and natural forces, it was purely in their terms of their potential influence on highway construction cost. Cite Roberts comments in thesis and article re: social / political issues, etc. Op.cit., 4.
[20] Roberts, "An Integrated System of Highway Location Analysis Using Photogrammetry and Electronic Computers," 76-78.

reading aerial photos: a stereoscope that presented stereopairs of aerial photographs as three-dimensional views (Figure 4.7). Stereoscopes had a robust nineteenth-century history of popular use; this analytical stereoviewing, however, was a skilled activity that required special training. Professionals who practiced it, from foresters to planners, did so in order to derive accurate and verifiable data regarding the characteristics of tracts of land.[21] This practice largely relied on the standardization of the act of looking (Figure 4.8), towards the goal of attaining a precisely defined, measurable outcome.

In summary, Roberts' approach defined landscapes on the basis of monetary cost; mixed visual simplicity with reliance on an extensive governmental mapping apparatus; used computation in anticipation of technological advancement; and prioritized technical proficiency, efficiency, and accuracy. All of these aspects of Roberts' highway location approach would migrate and morph in the design-based approaches soon to follow. His purely quantitative logic of drawing and making was inherent to his profession; in Alexander and McHarg's design-based fields, however, quantitative and qualitative methods were typically mixed together in a variety of ways. The quantitative extent of Roberts' mapping logic, therefore, would constitute a notable departure from prior design practices. The particular ways that the Alexander/Manheim and McHarg teams adapted and altered Roberts' approach, meanwhile, would lead to a series of tensions between their projects' ostensible aims and their representational logics.

[21] Stereopair analysis for mapping purposes was a skilled practice, taught in universities in the departments that used it, including geography, forestry, and landscape architecture. For a discussion of the subtleties of stereopair viewing techniques, see Belcher, "The Five Facets of Aerial Viewing." For more on the popular history of stereoviewer use, see Jonathan Crary, *Techniques of the Observer: On Vision and Modernity in the Nineteenth Century* (Cambridge, Mass: MIT Press, 1990), 116-136.

"The Use of Diagrams in Highway Route Location: An Experiment"

In the early 1960s Christopher Alexander was a doctoral candidate in Architecture at Harvard University, working on a dissertation that would eventually be published as *Notes on the Synthesis of Form*.[22] During this time he conducted research with Marvin L. Manheim, a doctoral student in engineering at MIT. Both were interested in real-world applications for emergent computer programs. In 1962, they received funding from the Bureau of Public Roads of the U.S. Department of Commerce and the Massachusetts Department of Public Works to conduct a highway location study for the area around Springfield, MA. This study was purely theoretical: the goal was not to locate an actual stretch of highway, but rather to test a new method for doing so.[23] The duo documented their study in three MIT Research Reports, each describing a different aspect of the project. The first detailed a systems-thinking based decision-making method for locating highway interchanges; the second focused on the use of computer programming for such decisions.[24] The third report, *The Use of Diagrams in Highway Route Location: An Experiment* is the one discussed here, for it explained the pair's visual analysis.[25]

Roberts' influence on Alexander and Manheim's work was clear. The authors thanked him in their acknowledgements section, referring to conversations they had with him during the

[22] Largely concerned with designing for complex interrelational systems, this book would later become influential among computer programmers. Christopher Alexander, *Notes on the Synthesis of Form* (Harvard University Press, 1964).
[23] Funding for such research was abundant in the 1950s, particularly through the federal Bureau of Public Roads through the Highway Research Board; it was frequently published in *Highway Research Bulletin*. Parts of Alexander and Manheim's work were presented at the 43rd annual meeting of the Highway Research Board in 1965. Christopher Alexander and Marvin L. Manheim, *The Design of Highway Interchanges: An Example of a General Method for Analysing Engineering Design Problems*, Research Report R62-1 (Cambridge, Massachusetts: Civil Engineering Systems Laboratory, MlT, 1962).
[24] Ibid.; Christopher Alexander and Marvin L. Manheim, *HIDECS 2: A Computer Program for the Hierarchical Decomposition of a Set Which Has an Associated Linear Graph, Research Report R62-2* (Cambridge: School of Engineering, Massachusetts Institute of Technology, 1962).
[25] Christopher Alexander and Marvin L. Manheim, *The Use of Diagrams in Highway Route Location: An Experiment, Research Report R62-3* (School of Engineering, Massachusetts Institute of Technology, Cambridge, Mass, 1962).

course of their work; within the study, they cited his method as a precedent for their approach. Reflecting Roberts' influence, Alexander and Manheim replicated many aspects of his method quite closely. As he had outlined, they referenced existing plan-based data to generate an extensive set of analysis maps, each one evaluating the suitability of locating a highway for all locations within the given region, relative to each given parameter.[26] Their 26 requirement diagrams of the area of the proposed highway (Figure 4.9) included many factors that Roberts had included on his list of relevant parameters. Also as Roberts had proposed, they added together all of these factors to achieve one final composite map, which determined the chosen location.

Alexander and Manheim diverged from Roberts, meanwhile, in the specific additive techniques that they used to combine multiple factor maps into one. They made these modifications in order to nuance Roberts' use of cost as a universal metric. They identified two major problems with his economic approach: first, they argued, reducing all parameters to a dollar amount meant that diverse factors – driver safety and grading expenses, for example – were treated equally in ways that did not reflect social values. Second, they argued that Roberts' cost mosaic failed to incorporate into analysis "the fact that the highway is an organised entity, and must be treated as such during its design."[27] In other words, when the freeway site was represented as a mosaic of dollar values, essential qualities of a highway, such as linear continuity and direct routing, were problematically left out of the analysis.

[26] Though it is clear that Alexander and Manheim referenced diverse existing factors such as topography, existing development, degrees of urbanization, water drainage patterns, weather patterns, and vegetation types, it is not clear whether Alexander and Manheim referenced aerial photographs to derive this information, or whether they relied on pre-existing maps.
[27] Alexander and Manheim, *The Use of Diagrams in Highway Route Location*, 90.

To address these issues, Alexander and Manheim devised a complex pattern for merging their factor maps (Figure 4.10). Rather than compiling all the relevant drawings into a single outcome, they used a tree-like combinatory system to cross-reference and re-trace their analyses repeatedly in nesting series, until all drawings had been distilled into one image (Figure 4.11, top). To do this, they designed a computer program that determined which maps to combine in subsets in order to achieve the most legible results.[28] Like Roberts, they used computers; but they did so to determine the pattern of diagram combination, rather than to calculate land values.

Alexander and Manheim chose, in fact, not to calculate cost values at all. Instead they represented them visually with tonal variation: drawing all their maps by hand, using photographic exposure to combine them, and then repeatedly re-tracing the combined maps. This approach took the analog method that Roberts had earlier considered but determined to be too labor-intensive and imprecise, and made it even more variable and interpretive. Citing gestalt notions that pattern recognition was an inherent ability of the human eye, Alexander and Manheim argued that retracing combined maps by hand could reinforce underlying patterns that, while perhaps only vaguely apparent in the maps themselves, nonetheless most accurately

[28] This decision-path problem structure reflected the capabilities of computers in the early 1960s, and manifested Alexander and Manheim's shared interest in using computers to make design decisions. While the highway location project used a tree-like combinatory pattern that worked with the capabilities of an available computer, Alexander would later renounce that problem structure in favor of more networked combinations. Alise Upitis, "Alexander's Choice: How Architecture Avoided Computer-Aided Design c. 1962," in *A Second Modernism: MIT, Architecture, and the 'Techno-Social' Moment*, ed. Arindam Dutta (Cambridge, Massachusetts: SA+Press, Department of Architecture, MIT, 2013), 474–505; Molly Wright Steenson, "Architectures of Information: Christopher Alexander, Cedric Price, and Nicholas Negroponte and MIT's Architecture Machine Group" (PhD diss., Princeton University, 2014), 37. Regarding the early development of Alexander's work see also Keller, "Fenland Tech," 40-65; Sean B. Keller, "Systems Aesthetics: Architectural Theory at the University of Cambridge, 1960-1975" (PhD diss., Harvard University, 2005). For more on the computer programming side of Alexander and Manheim's research see Alexander and Manheim, *Hidecs 2*.

manifested the continuity and other spatial qualities required for the location of highways.[29] By incorporating hand drawing at key moments, Alexander and Manheim argued that they could better calibrate the outcome of their analysis.

In its specific application, this mapping approach occurred as follows. Alexander and Manheim first created maps representing the best and worst locations for 26 different factors that they determined were relevant to highway location. For each of these, they cross-referenced source data to generate a gray-tone map representing the least optimal highway locations with the lightest tones, and the most optimal areas with the darkest tones.[30] Each of these maps had unique spatial patterns and textural variations. For example: in the "Weather Effects" diagram (Figure 4.12) Alexander and Manheim interrelated topographic data with information regarding atmospheric conditions, and then sketched the challenges posed by various weather conditions with broad washes of gray, outlined colorless areas, and dark gray/black arcing figures. The southeast sides of hills were considered desirable highway locations because they were sheltered from prevailing northeast winds; they were marked with darkly colored curving forms. Areas of fog and unbroken crosswinds were undesirable highway locations, so they were represented with light tones or no color. The resulting drawing – unique, visually expressive, and replete with immeasurable information – were markedly different from Roberts' proposed mosaics of discrete calculated boxes (Figure 4.6).

[29] Roberts discussed the problem of needing to smooth out the results of analysis in order to generate a highway path, stating that according to the final analysis the optimal location of a line might be twisty or overly sinuous at first, but that the engineer could smooth out any tangles to derive the more efficient route. Roberts, "An Integrated System of Highway Location Analysis Using Photogrammetry and Electronic Computers," 72.

[30] Flipping Roberts' proposed light/dark associations in this way made it possible to draw optimal locations with path-like shapes, and thereby convert factor maps' mosaic shapes into linear highway forms.

Having generated the requirement drawings, Alexander and Manheim then developed a pattern for their combination. They used their computer program to calculate the optimal nesting patterns based on data that they input regarding which maps were likely to "conflict": to result in illegibly even images because of contrasting spatial qualities.[31] After determining the preferable combinatory "tree," the duo superimposed and compared their requirement maps in nested series: using photography to overlay the maps, and sketching to clarify them. For example, they derived a single combined path diagram from requirements 6 (Interference During Construction), 17 (Weather Effects), and 24 (Existing Transportation Systems) (Figure 4.13). For each subset, they worked with a photographic company to use multiple partial photographic exposures and combine the negatives of the source maps into a single image.[32] They then projected the composite image onto a drawing board, and applied multiple layers of charcoal or graphite to the paper onto which the image was projected: looking for the image's darkest areas, and drawing over those areas with path-like forms. Next, they photographically combined these new path drawings with path drawings produced from other subsets, projected the results, and the darkest areas were traced again. This combining and tracing continued until the one single composite path drawing was attained (Figure 4.11, top).

Alexander and Manheim described this tracing process as follows:

> When we superimpose these diagrams mechanically, the areas where this reinforcement occurs come out blackest, of course. However, in this first composite, these dark areas

[31] For example, a diagram that consisted of vertical lines and one that consisted of horizontal lines would result in no possible highway path due to the pattern that their combined patterns would create. Based on such incompatibilities, Alexander and Manheim made lists of diagrams that should not be combined, and used the computer to calculate subsets that would avoid those problematic combinations. Alexander and Manheim, *The Use of Diagrams in Highway Route Location*, 97-107.

[32] In their Acknowledgements section Alexander and Manheim thank Alexander Adams of AD-Link Inc., commercial photographers and processers, for his assistance. Alexander and Manheim did not emphasize the interpretive significance of the photographic step in their writing, and it is unclear how much of the photographic exposure they actually did themselves. Op.cit., Acknowledgements.

> will be discontinuous, zigzagging, running in several directions at once, of unclear overall shape, etc. In other words, the mechanically composite photograph is a relatively unstructured pattern of greys. However, the eye, being what it is, we can always detect an underlying pattern in such a diagram, and we can bring this underlying structure out. This process is known as 'leveling and sharpening'. It is usually defined as the process of establishing the basic pattern properties of a stimulus more firmly than they exist in the original stimulus. The effect of redrawing the original composite, then, is to bring out just the kinds of property a highway has to have as a 'path'.[33]

Here Alexander and Manheim defined the redrawing step as a highly advanced form of problem solving. By approaching viewing and drawing in this way, they created a new role for visualizing within Roberts' method: one that was at simultaneously technical (using multiple photographic exposures), perceptive (relying on the seeing eye to discern areas of greatest darkness), and interpretive (translating composite dark areas into hand-drawn paths on paper). In Alexander and Manheim's version of the highway location process, analytical observation and manual drawing were practiced as one inseparable act; together they were essential to achieving a solution.

Alexander and Manheim's decision to carve out an important role for hand drawing was an interesting one given that their primary project focus was computer-based decision-making, and their precedent was an explicitly computational methodology whose creator cautioned against analog methods. In essence, the authors saw design-based drawing techniques as a solution to the problematic simplicity of Roberts' cost calculations. To counter their precedent's cost-based approach, they jettisoned mathematical calculation in favor of visual compilation. They then took yet another step away from cost-based calculation: forgoing the spatially discrete, additive analysis proposed in Roberts' analog approach and instead adopting looser techniques that

[33] Op.cit., 111.

invested the actions of drawing with a sensitive attunement to the environmental, spatial, material, and social conditions of the highway site.

Alexander and Manheim's approach departed even further still from their precedent, as they used drawing not only to temper a cost-centric approach to planning, but also to attune to natural phenomena in a markedly responsive and holistic way. The citations included in their report demonstrate this intention, characterizing the actions of viewing and drawing as uniquely capable of recognizing and supporting both built conditions and natural agencies.[34] For example, stating that "the eye, being what it is, can always detect an underlying pattern in such a diagram, and we can bring this underlying structure out," they cited Gestalt psychologists and theorists Rudolf Arnheim, Friedrich Wulf, Wolfgang Kohler, and Kurt Gottschaldt.[35] These references aligned Alexander and Manheim with an understanding of the viewing human body as inherently equipped to perceive the patterns and structures of a larger natural order. It also linked them to modernist designers and artists who drew on Gestalt theories, such as György Kepes, who would later publish a piece by Alexander in his 1966 edited volume *The Man-Made Object*.[36] Such

[34] One might conjecture that Alexander and Manheim would have used computer graphics if they could have. However, Alexander's preferences belie such conjecture: he continued to use hand-drawn diagrams later in his career and repeatedly suggested that diagramming was essential to effective design process. Alexander, *Notes on the Synthesis of Form*, Preface; Keller, "Systems Aesthetics," 68-72; Steenson, "Architectures of Information," 49-54.

[35] This concept was also discussed in Harvard psychology professor Gordon Allport's 1961 text *Pattern and Growth in Personality*; though Alexander does not cite that text here. Alexander and Manheim, *The Use of Diagrams in Highway Route Location*, 112. Gordon W. Allport, *Pattern and Growth In Personality* (New York: Holt, Rinehart and Winston, 1961).

[36] For more on Kepes, see Chapter Three. Other Bauhaus figures' interests in Gestalt thinking have also been well documented. Christopher Alexander, "From a Set of Forces to a Form," in *The Man-Made Object*, ed. György Kepes (George Braziller, New York, 1966), 96-107. Marianne L. Teuber, "Blue Knight by Paul Klee," in *Vision and Artifact*, ed. Mary Henle (Springer, New York, 1976), 131-151; Geert-Jan Boudewijnse, "Gestalt Theory and Bauhaus – A Correspondence," *Gestalt Theory* 34.1 (2012), 81-98.

influences modeled viewing and drawing as closely intertwined interpretive actions that put designers in active dialogue with their environment.[37]

These references to Gestalt thinking also point to a broader tradition of attunement to natural forces among modernist designers.[38] Alexander was connected to this tradition through his studies at the GSD and his research at MIT; in both institutions, modernist pedagogies held sway through the 1960s.[39] More evidence of this interest in investigating natural patterns can be found in Alexander's *Notes on the Synthesis of Form,* which was written at the same time as the highway study. Here he cited figures such as Lancelot Whyte and Albert Dalcq, who influenced modernist notions of biology and ecology from the early twentieth century through the postwar years.[40]

In *Notes*, Alexander also cited Kepes, Paul Klee, and Louis Kahn regarding the specific challenges of using diagrams to represent living forces and forms. Alexander referenced Kepes' work with photographs of observed phenomena. Regarding this work, Kepes stated that the artist "only assists at the birth of a living form that grows from deeper strata than his conscious efforts could reach. He invents techniques that give the fewest obstacles to the free flow of organic

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[37] While Gestalt influences on the Bauhaus have historically been seen as reductive in character, scholars have recently revised this understanding, noting that Gestalt thinking promoted distinctly open-ended explorations of the roles of humans in the world. See Roy Behrens, "Art, Design and Gestalt Theory," *Leonardo*, 31.4 (1998), 299-303; Julia Moszkowicz, "Gestalt and Graphic Design: An Exploration of the Humanistic and Therapeutic Effects of Visual Organization," *Design Issues* 27.4 (2011), 56-67.

[38] For accounts of modernist ecocentrism and biocentrism, see Peder Anker, *From Bauhaus to Ecohouse: A History of Ecological Design* (LSU Press, 2010); Oliver A. I. Botar and Isabel Wünsche, eds., *Biocentrism and Modernism* (Ashgate Publishing Ltd., 2011); Oliver A. I. Botar, *Technical Detours: The Early Moholy-Nagy Reconsidered* (City University of New York, 2006).

[39] Although Gropius left the Graduate School of Design in 1952, Vorkurs-based Basic Design pedagogy held sway there well into the 1960s. Jill Pearlman, *Inventing American Modernism: Joseph Hudnut, Walter Gropius, and the Bauhaus Legacy at Harvard* (University of Virginia Press, 2007), 200-238.

[40] Alexander most likely read Whyte and Dalcq while a student at Cambridge, given both individuals' involvements in the 1950s Independent Group exhibition and book *Aspects of Form*. Alexander, *Notes on the Synthesis of Form*, 195-196.

information."[41] Alexander referred to Klee's discussion of the arrow in *Pedagogical Sketchbook*, which opened with an association between thought, drawing subject, and landscape: "the father of the arrow is the thought: how do I expand my reach? Over this river? This lake? That mountain?"[42] Alexander mentioned Kahn's suggestion that architects should enter into dialogue with their materials, asking what a given form "wants to be."[43] Alexander echoed this idea in his own writing: proposing, for example, that the designer should "determine, as abstractly as possible, the physical relation which each individual tendency is seeking."[44] All of these references illustrate a desire to work in a way that was interactive with and attuned to dynamic living phenomena, as perceived and explored through the actions of drawing.[45]

In all of these ways, Alexander and Manheim's highway project and Alexander's writing were both concerned with cultivating design practices that could encounter, mediate, and

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[41] György Kepes, *Language of Vision* (Paul Theobald, Chicago, 1944), 194. See also Anna Vallye, 'The Middleman: Kepes' Instruments', in *A Second Modernism*, ed. Dutta, 162-172.
[42] Paul Klee and Sibyl Moholy-Nagy (trans.), *Pedagogical Sketchbook* (Faber & Faber, New York, 1953), 54. For more on Klee's ideas regarding connecting with the natural world via artistic process, see Richard Verdi, *Klee and Nature* (Rizzoli, New York, 1985), 191-210.
[43] Kahn was trained at University of Pennsylvania in the Beaux-Arts tradition, which highlights the fact that the responsive, open, and nature-centric qualities of drawing that were taught and practiced by modernist designers did not necessarily originate in modernist innovation. For more on this issue, see Chapter One.
[44] Alexander, "From a Set of Forces to a Form," 101.
[45] It should be acknowledged here that Alexander has expressed a marked ambivalence regarding the role of hand drawing in design. Keller and Steenson have both explored Alexander's ambivalence in this regard, tracking his contradictory statements and detailing the resulting unresolved tensions. On one hand, Alexander characterized modernist architectural drawing as devoid of capacity to solve design problems. He quickly completed his architecture degree at University of Cambridge after deciding that the methods taught there were highly questionable, and his interest in computational design was grounded in a conviction that modernist design process was fundamentally flawed. On the other hand, he has explicitly identified the importance of diagramming to solving design problems, and his citations of Kepes, Klee and Kahn directly link this diagramming to modernist drawing practices. It would seem, then, that Alexander rhetorically criticized methods that were nonetheless part and parcel of his practices as a designer: his drawings with Manheim revealed a form of engagement through drawing that Alexander may not have fully acknowledged, but did clearly practice. Keller, "Systems Aesthetics," 68-72; Steenson, "Architectures of Information," 49-54. Stephen Grabow, *Christopher Alexander: The Search for a New Paradigm in Architecture* (Stocksfield: Oriel Press, 1983), 29-32, 91-92; Alexander, *Notes on the Synthesis of Form*, 209.

reinforce the agencies of natural and built forces and forms. This approach to drawing as a receptive and reciprocal act is also apparent in the artifacts of Alexander and Manheim's representations, whose openness as part of an ongoing process of deduction is apparent. Outlined forms are rarely present, and gradient shifts between dark and light defy clear categorization. In their representational looseness and roughness, marked by variability and texture of line, evidence of the maker's hand remains. These qualities suggest a process that is not closed, but rather malleable, available for further interpretation and manipulation. By inviting and maintaining generative ambiguity in these ways, Alexander and Manheim developed a practice that, while circumscribed by structure, nonetheless emphasized drawing as a relationally responsive act, and generated products that appeared available to uncertainty and change.

In Alexander and Manheim's highway location project we find an explicitly technical and computational method mixed with a way of working that understood the designer as innately equipped to perceive, direct, and manifest qualities and forces intrinsic to highways and sites – technologies and natures – alike. As in the work of those who Alexander cited as influences, this understanding was both theorized in text and enacted through drawing. Such enactment was used strategically, to complement a focus on cost that the designers found problematically reductive. At the same time, their technique and discourse referenced a broader tradition of drawing to attune to the unique dynamics of natural and material forces and flows. In this way their approach – complex, nuanced, and thickly referenced, suggested an agenda far greater than merely correcting Roberts' prior methodological errors.

What compelled this engineer-designer duo to introduce such a notably human, anti-computational element into an otherwise highly technical and precise method? And what did this engineer/architect team *gain* by so assertively integrating design-based drawing techniques into

their highway location approach? These questions return us to the theme of the "environment." In many ways, Alexander and Manheim's highway location approach bore the hallmarks of the environmentalism emerging in design work more generally at this time. Alexander's writing reflects this: he referenced the environment several times in *Notes on the Synthesis of Form*, defining it as a zone of human living, and noting the unique difficulty of solving for its nebulous complexity. In the book's "Introduction," he described the environment as something systematic and vital in its capacity for growth:

> Consider the task of designing a complete environment for a million people. The ecological balance of human and animal and plant life must be correctly adjusted both internally and to the given exterior physical conditions… The environment must be organized so that its own regeneration and reconstruction does not constantly disrupt its performance.[46]

According to Alexander and Manheim, using drawing to distill combined maps enabled them to better articulate the organizational qualities of the highway. Upon closer investigation, hand drawing clearly enabled them to articulate the organizational qualities of environmental forces and forms as well. Much like Halprin's Panhandle Freeway proposals and Appleyard, Lynch, and Myer's *View from the Road* drawings, Alexander and Manheim's highway location work deployed modernist techniques and methods in order to visualize the highway as an environment: as something more dynamic, complex, and interrelational than preceding approaches had proposed.

This integration of computation with design technique would take a much different form in Ian McHarg's version of the highway location method. Alexander and Manheim computerized one part of the decision-making process, while relying on relatively traditional, hand-based drawing techniques in another part. As we will see, McHarg would standardize the act of

[46] Alexander, *Notes on the Synthesis of Form*, 2-3.

drawing itself, while resisting the technical reduction of natural forces on other fronts. As McHarg sought to apply highway location in a public forum, the method would become more visually precise, informationally opaque, and explicitly "environmental;" it would also become more directly political.

"A Comprehensive Highway Route Selection Method: Applied to I-95 Between the Delaware and Raritan Rivers"

In 1950, Ian McHarg completed his studies in landscape architecture and urban planning at the Harvard Graduate School of Design with a final collaborative thesis project: a planned redevelopment of downtown Providence, RI.[47] The project proposed clearing and reconstructing much of the urban core, and defining it with a beltway tightly circling the city center. The team's proposal largely privileged freeway placement and engineering over landscape design: burying the Providence River underground, and replacing the city's historic river-adjacent market square with a massive freeway interchange. Using starkly defined and crisply edged plan-view illustrations marked on transparencies which could be stacked to juxtapose several different maps at once, the team presented the redeveloped city as a precisely calibrated, highly constructed, networked system (Figures 4.14, 4.15).[48]

Fifteen years later McHarg once again worked with highway design, and once again deployed layered mapping to do so. Over the intervening time his interest in precise, layered land analysis had remained and evolved. After becoming chair of a recently revived department of

[47] McHarg's thesis was conducted in collaboration with Architecture students Robert L. Geddes, William Conklin, and Martin Sevely. After its presentation, this project was covered in *The Rhode Islander*. Anthony Alofsin, *The Struggle for Modernism: Architecture, Landscape Architecture, and City Planning at Harvard* (WW Norton & Company, 2002), 209-211. "Providence Tomorrow?" *The Rhode Islander: Providence Sunday Journal*, June 11, 1950.

[48] McHarg attended GSD in the late 1940s, during a period when a far more organized and rational approach to landscape modernism was being embraced than the one that landscape architecture students had cobbled together in the 1930s and early 1940s. Alofsin, *The Struggle for Modernism*, 196-227.

landscape architecture at the University of Pennsylvania in 1954 and founding the design and planning firm Wallace, McHarg, Roberts and Todd with David Wallace in 1862, McHarg had conducted several large-scale landscape planning projects for developing regions. His approach was ever evolving in these works, with his students' and employees' mapping approaches gaining detail, breadth, and technical clarity with each new project.[49] By the early 1960s, McHarg's attitude regarding the design of cities and urbanizing regions had shifted towards environmental issues as well. In this period, he applied for grants to study urban ecological design, developed a foundational course on "Man and the Environment," and hosted "The House we Live In," an environment-oriented television show on CBS.[50]

By 1965, McHarg's approach to urban and regional development had shifted so much that he decided to explore highway design as a protester, rather than a builder. That year, Princeton, NJ-area residents learned that the New Jersey Division of Highways had slated the Philadelphia-to-Trenton portion of Interstate 95 to cut through an Audubon sanctuary within Princeton Township. Like urban dwellers, Princeton residents feared not only a loss of bird habitat, but also disruption to property values, local geography, and existing ways of life. Furthermore, they feared urbanization itself. Located directly between New York City and Philadelphia, many Princeton residents saw themselves as part of a "great megalopolitan corridor," and worried that the arrival of highways would signal the end of central New Jersey's semi-rural quiet.[51] Against

[49] This is most apparent in viewing the sequential evolution of student work from McHarg's various studios and projects in these years. Ian McHarg Collection, Architectural Archives of the University of Pennsylvania.
[50] "A Proposal to the Rockefeller Foundation for Research into the Design of the Urban Environment," June 2, 1958, Box 456, Folder 3902, Record Group 1.2, Series 200, Rockefeller Foundation Collection, Rockefeller Archive Center; "Man and Environment" Syllabus, 1960, Curriculum Documents and Student Work, 1958-1999, The Architectural Archives, University of Pennsylvania; Ian L. McHarg, *A Quest for Life: An Autobiography* (John Wiley & Sons, 1996), 184,162-166.
[51] Ian McHarg, "Where Should Highways Go?" *Landscape Architecture* 57.3 (1967), 179. One Princeton freeway protester warned of "New Jersey's ominous future as a corridor state between Philadelphia and

this possibility, many residents decided to protest the planned location of the highway: mobilizing ample local resources to form a nonprofit organization, the Delaware-Raritan Committee on I-95.[52]

In December 1965, when McHarg presented a lecture on ecology and environmentalism at the Princeton Institute for Advanced Study, Delaware-Raritan Committee members seized an opportunity to enlist him in their cause. McHarg spoke on ecological models for landscape architectural design, detailing biologist Lawrence J. Henderson's work regarding organismal fitness for one's environment. However, as he later described, "the interests of the audience lay not in cosmic formulations but in very parochial problems."[53] After his presentation, members of the Delaware-Raritan Committee described their protest against the proposed routing of I-95, and asked him to conduct a study of alternate routes. McHarg agreed to take the job, and was hired to conduct a 6-week highway location study.[54]

In this quick project, McHarg and WMRT employees (and former students) Narendra Juneja and Lindsay Robertson developed a variation on Roberts' highway location method, likely based on knowledge of Alexander and Manheim's version as well.[55] Like Roberts and

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New York, burdened with possibly 30 to 40 major highways." "This is Princeton," *Town Topics*, March 17, 1966.

[52] "Topics of the Town," *Town* Topics, January 1, 1966. The Delaware-Raritan Committee on I-95 eventually merged with the Stony Brook Millstone Watershed Association, which merged with World Wildlife Fund in 1990.

[53] McHarg, *A Quest for Life*, 184.

[54] This work was conducted through McHarg's firm WMRT, with the assistance of former Penn students. McHarg typically led design projects through two avenues – one was WMRT, in which he was a partner; the other was the Penn landscape architecture program, where he would often organize studio projects to conduct research and design work for real-world clients. McHarg's work at WMRT and Penn often overlapped; students' preliminary studio-based research and experimentation would often later inform WMRT projects, and McHarg frequently hired former students to work for him at WMRT. Curriculum Documents and Student Work, 1958-1999, The Architectural Archives, University of Pennsylvania.

[55] McHarg actually claimed that he invented the I-95 analysis method with the assistance of Juneja and Robertson, but the similarity of the I-95 project to the two earlier ones is clear, and McHarg's assertion is

Alexander and Manheim, McHarg's team would create several maps of different relevant factors, and determine the path of the proposed highway on the basis of the combined maps. Like Roberts, McHarg's team would combine all their maps at once; as in Roberts' analog version, they would use crisply edged, precise imagery that marked the highway appropriateness of different portions of the site with three different grey tones.

In alignment with Alexander and Manheim, McHarg was highly critical of the reductive way that Roberts used cost analysis, and sought to expand the range of site qualities included in highway location analysis. His team's approach to countering the reductiveness of cost was markedly different than Alexander and Manheim's, however, both in discourse and in technique. In I-95 related writing and presentations, McHarg did not question the use of cost as a basis for defining land. Rather, he argued that not enough qualities of land had been incorporated into engineers' cost analyses, proposing that cost analysis be extended to encompass "non-price benefits and costs" as well.[56] McHarg reinforced this semi-economic framework throughout the I-95 project: describing parameters as "values," and referring to the individual analysis maps as "parameters," "criteria," and "critical determinants" – all terms commonly used in economic analysis.[57] In this context, McHarg's recurring description of the project goal – to achieve

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not a reliable indicator of influence, as it is well known that he did not cite his precedents. In some ways the McHarg team's approach matched Roberts' method more closely, but Manheim wrote that McHarg had used his and Alexander's method, as did Director of Programs for the American Institute of Architects Andrew F. Euston Jr., in a 1968 article in Highway Research Record. Alexander and Manheim's work had been published two years earlier, and landscape architects were familiar with the study (see Lawrence Halprin's admiration of the work in Chapter Five). Anne Whiston Spirn, "Ian McHarg, Landscape Architecture, and Environmentalism: Ideas and Methods in Context," in *Environmentalism in Landscape Architecture*, ed. Michel Conan (Washington, D.C.: Dumbarton Oaks Research Library and Collection, 2000), 102; Ian McHarg, *A Quest for Life*, 184; Biography, Box 7, Folder 2, Marvin L. Manheim Papers, MIT Institute Archives and Special Collections; Andrew F. Euston Jr., "*Design Concepts for the Future*," Highway Research Record 220 (1968), 5-10.

[56] McHarg, "Where Should Highways Go?", 179.

[57] Op.cit., 181; Ian McHarg, "A Comprehensive Highway Route Selection Method," *Highway Research Record* 246 (1968), 1-15.

"maximum social benefit at the least social cost" – was something of a rhetorical balancing act: framed as a repudiation of cost-based analysis, yet clearly inspired by an economic framework.[58] In his rhetoric, McHarg implied that land was social and environmental in content, but quantifiable in method.

The McHarg team's approach was also a balancing act in its technique and method. As in both the Alexander and Manheim approach and Roberts' analog version, the McHarg team distilled geographic data for each relevant factor into tones. They used Roberts' tone/desirability correlation, making the lightest tone most desirable, and the darkest tone least desirable. They used only ten factors (Figure 4.16), but within those factors they included qualities that neither Roberts nor Alexander and Manheim taken into account, such as wildlife, recreational value, and historic values (Figure 4.17). Like Roberts, the McHarg team combined all factor drawings at once. Once plotted and composed, the ten transparent drawings were stacked together and photographed, resulting in a single composite image (Figure 4.18, top). The team then overlaid another drawing sheet and marked the recommended highway route (plus a couple of alternate paths) through the lightest areas in the composite drawing. This final drawing of the recommended route was also represented with transparent mylar (Figure 4.18, bottom).

Unlike their precedents, the McHarg team made no use of computers whatsoever. They did, however, deploy computational logics and aesthetics in making their imagery: jettisoning Alexander and Manheim's interpretive approach to drawing in favor of a more precise adherence to data and delineated appearance. This was achieved through a few specific actions. First, unlike either precedent, the McHarg team mostly relied on direct tracing of source data. Second, like

[58] McHarg also reinforced a sense of the I-95 project's quantifiable objectivity with references to its completeness, often referring to the project's "comprehensive" method. Ibid.; McHarg, "Where Should Highways Go?", 179-181; "Topics of the Town," *Town Topics*, January 13, 1966.

Roberts' analog method, they created their maps – or rather, the final version of their maps – by applying different shades of adhesive film onto sheets of transparent mylar.[59] The team's "Agricultural Value" map (Figure 4.19), for example, was based on an Engineering Soils Survey from Rutgers University. After determining that the only viable agricultural land in the area corresponded with U.S.D.A category II soils, the team presumably used a light table to make a new map that traced those areas of the Rutgers map, then used these traces as cut-lines for adhesive film, and applied the cut film to mylar sheets.[60] The resulting maps essentially reformatted the source data, using hand drawing as an intermediary, unseen action of rote replication. The final use of film on acetate elided the very presence of that hand, instead presenting an almost machine-like precision defined by hard edges, closed forms, and even shades.

By hewing more closely to the precision and visual simplicity of Roberts' proposal, the McHarg team significantly reduced opportunities for the kind of drawing-oriented interpretation that Alexander and Manheim had used. This reduction occurred in the making of each individual factor map: by directly tracing source data and hard-lining their maps, the team forwent drawing-based decisions. Unlike Alexander and Manheim, they did not draw different sources of data together, deploy varied thicknesses of line, shapes, patterns, and depths of tone, or manually

[59] McHarg and others have referred to these sheets as mylar, so that is the term I use here; according to technical texts from the mid-1960s, however, adhesive film was typically used on acetate. Ian McHarg, *A Quest for Life*, 185; Myles Boylan and Daniel W. Varin, *Graphic Techniques: A Manual for Urban Planners: a Description of the Use of Materials, Presentation Methods, and Report Publication Procedures for Effective Graphic Communication in Urban Planning* (Michigan State University, Department of Landscape Architecture & Urban Planning, 1956).

[60] I am assuming here that McHarg's team first traced the maps by hand, because it would be unnecessarily burdensome to cut acetate sheets without first creating a hand-drawn tracing of the relevant areas that could be used as a template for the cutting.

translate visual photographic data into path-like forms.[61] The reduction also occurred in the team's process of combining drawings: their equivalent to Alexander and Manheim's sixteen different "leveling and sharpening" drawings was one final path drawing, which did not occur until all drawings were complete and collated. As McHarg explained, "the method was known but the evidence was not. It was necessary to await compilation, make the transparent maps, superimpose them over a light table and scrutinize them for their conclusion."[62] In essence, the McHarg team's approach standardized the actions of design drawing: reducing to rote acts practices that were traditionally utilized as means of exploration and revelation.

In all these qualities, the I-95 project exemplified and amplified a shift that was taking place in McHarg's design approaches in the 1960s. At this time, in McHarg's studio and professional projects alike, drawing was becoming an increasingly distributed act: referencing more maps, shared among more designers, and mediated through more tools of measurement. In the I-95 project, source maps included USGS topographic maps, an aerial photo survey, a Rutgers University soil survey, realtor maps of land values, well location maps, and abundant client data. By 1967, McHarg's sources would expand even further: one of his studio projects

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[61] McHarg's students had already been trained, to a degree, in the kind of fidelity that was used here: they had learned to analyze aerial photographs, and were taught throughout the 1960s how to use of planimeters and dot grids, tools traditionally used by foresters and geologists for plotting and calculating the square footage of different bound areas within a map. University of Pennsylvania landscape architecture department syllabi and studio photographs from the 1960s and early 1970s show the teaching of these various forestry tools and methods. Curriculum Documents and Student Work, 1958-1999, The Architectural Archives, University of Pennsylvania.

[62] Ian L. McHarg, *Design with Nature* (American Museum of Natural History, New York, 1969), 35. It should be acknowledged that under McHarg the act of viewing gained some of the connection with natural forces that drawing had lost. When designers awaited compilation to analyze the results of their mapping, the moment of viewing the compiled drawings took on a special significance as a moment of encounter with and interpretation of a living system too complex to be fully comprehended (see Figure 4.18, bottom). Such viewing was less active than Alexander and Manheim's in that it was separated from manual action. But it was more engaged than Roberts' airphoto analysis because it was fundamentally interpretive: the designer had to sift and sort through the drawing's many layers in order to reach a conclusion.

would make use of the above resources, plus state geographic surveys, the U.S. Soil Conservation Service, state highway commissions, the U.S. Forest Service, the National Park Service, local and regional planning commissions, and the U.S. Army Corps of Engineers.[63] During this period, processing this abundant data became a time-consuming and even somewhat ritualized process among McHarg's students. In several photographs from that period, groups of students sit together with pencils in hand, clustered around a single drawing (Figure 4.20). In others, the analysis projects of prior years' studios are pinned on the wall for students to reference as they conduct their own analyses (Figure 4.21).[64]

As the McHarg team deployed Roberts' engineering-based techniques and methods towards this novel approach, they essentially renounced the kinds of modernist understandings of designer/nature relationship that earlier freeway projects had embraced. The project's use of layered inventories at large scales were not new to McHarg, or to the profession of landscape architecture; indeed, such layering had a long history, beginning in the late nineteenth century.[65]

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[63] In the I-95 project, sources were USGS (topos, physiographic obstructions, recreational value, wildlife value, water values), aerial photo survey (urbanization, scenic value), Rutgers U. Engineering Soil Survey (Ag. Value), Edmund Cook & Co, realtors (contributed to: land values) and client (sole source: residential quality, historic value; contributed to: recreation, wildlife, water, erosion, land values), Well location maps (contributed to: water values). Data sources listed in maps produced by students in the 1967 Delaware River Basin Study were more extensive, including aerial photos (for land uses, sometimes for vegetation – both read by students themselves), USGS and state Geographic Surveys (topo maps, groundwater maps, soil surveys), U.S. Soil Conservation Service (soils, agricultural suitability) (collection), State Highway maps (locations of roads), U.S. Forest Service (for vegetation classification), National Park Service maps (recreation), local/regional planning commission maps (for proposed development), University maps (EG College of Agriculture, soils departments), U.S. Army Corps of Engineers.

[64] Ibid.

[65] Layered inventories of landscape characteristics had been used at large scales for several decades already by the time McHarg's team used them in the I-95 project. As evidenced by his graduate thesis for Providence, McHarg's work rarely involved the kind of spatial, experiential approaches that fellow GSD alumni such as Halprin had embraced so fully just a few years prior to his attendance. In professional and pedagogical work both, he tended instead towards landscape architectural projects at large urban and regional scales: building on the planning-oriented approaches of late nineteenth-century figures such as Olmsted, and the 1930s work of the RPAA. McHarg's studio projects from the late 1950s through early

However, the flatly inexpressive representational qualities deployed here, the fundamentally computational logic underlying the team's use of those qualities, and the work's heavy reliance on an extensive governmental mapping apparatus all constituted a departure from prior freeway designs. Both the *View from the Road* work discussed in the Chapter Three and Alexander and Manheim's approach had applied modernist understandings to freeways and highways in novel ways, integrating uses of data together with techniques that were immediate and experiential in character. The McHarg team, in contrast, jettisoned open, sensory drawing techniques in favor of a more overtly computational approach to making landscape imagery. This approach was not implemented by computer, or through mathematical calculation. Nonetheless, it premised the very act of drawing on a quantitative logic and a concern for technical precision. This was a new direction for McHarg, and for the field of landscape architecture.

Performing Objectivity, Embedding Bias: Towards Political Obfuscation in Design

As detailed above, an embrace of technical objectivity was prevalent throughout the McHarg Team's I-95 project. It would be a grave mistake, however, to understand the multi-

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1960s involved drawing techniques that built on those earlier influences. In a spring 1961 studio project, for example, students conducted large-scale inventories of natural and cultural resources, using overlays and descriptive drawing techniques reminiscent of the late nineteenth and early twentieth-century urban-scale work of Charles Eliot and Warren Manning, as well as the 1930s-50s mapping work of forester/planner Benton MacKaye. Some of this work, such as McHarg's spring 1961 "Delaware Basin Development" studio, presaged the I-95 approach that the McHarg team used in the I-95 project in that it inventoried and interrelated various landscape characteristics. However, these earlier works were descriptive rather than computational, in that they did not deploy an additive approach to determining the value of land. Also of interest in their descriptive and expressive qualities are Juneja's spring 1965 final thesis drawings, which extended earlier color-based mapping approaches such as Eliot's towards an even more expressive, hand-made approach. Regarding earlier layered land inventory approaches, see Carl Steinitz, Paul Parker, and Lawrie Jordan, "Hand-Drawn Overlays: Their History and Prospective Uses," *Landscape Architecture* 9 (1976), 442–454; Anita Berrizbeitia, "Between Deep and Ephemeral Time: Representations of Geology and Temporality in Charles Eliot's Metropolitan Park System, Boston (1892–1893)," *Studies in the History of Gardens & Designed Landscapes* 34.1 (2014), 38-51. Narendra Juneja, "The Upper Gangetic Plain," Curriculum Documents and Student Work, 1958-1999, The Architectural Archives, University of Pennsylvania.

layered *performance* of this objectivity as evidence of technical, scientific, or objective methods. On the contrary, details underlying the I-95 drawings' apparent precision and clarity demonstrate aesthetic decisions and fundamental biases. While these contradictions undermined the projects' transparency and coherence, they also proved persuasive in political negotiation.

The I-95 maps' imagery and production techniques presented a distinctly *un*biased appearance; and yet the way they deployed data was strongly weighted towards the interests of McHarg's clients. Property value data was factored into McHarg's analysis twice under different categories; this favored Princeton residents, who had the highest property values in the region.[66] Furthermore, several of the team's source maps, including those indicating property value, were provided by the Delaware-Raritan Committee in the first place.[67] The abstraction of the maps, meanwhile, thoroughly elided these biases. Their smooth textureless precision and delineated forms evoked the clarity of topography and soil maps, but without offering the same level of detail. Rotated off true north and lacking the location of natural features or nearby towns, the imagery was unmoored from place information that a viewer might easily recognize and reference.[68] Lastly, the use of adhesive film elided all evidence of hand-drawing: without marks of the individual human hand carrying traces of subjectivity and fallibility, the drawings

[66] In yet another contradiction, this weighting also heavily favored the very economic factors that McHarg overtly criticized. McHarg later acknowledged this bias. McHarg, *Design with Nature*, 35.
[67] "A Comprehensive Highway Selection Method Applied to I-95 Between the Delaware and Raritan Rivers (1965)," Reports, Ian McHarg Collection, Architectural Archives of the University of Pennsylvania.
[68] This abstraction was further amplified by the general and vague terms in which the location study was presented at meetings: the McHarg team's criteria for each parameter were detailed in the fine text of the project booklet, but in public meetings the parameters were typically referred to broadly and collectively, as "social values, resource values, and aesthetic values," without further detail. "Topics of the Town," *Town Topics*, January 13, 1966; "Topics of the Town," *Town Topics*, January 20, 1966.

presented objectively: in contrast to their heavy weighting in favor of the client, they appeared abstract, neutral, and absolute.[69]

Here was peculiar series of misalignments. All at once, McHarg's team purported to understand landscape as something that transcended economics; incorporated a cost-based quantitative logic into design process; and used data and drawing in ways that simultaneously performed and undermined the transparency of that logic. In a strange way, this brought the team full-circle. Through a tangled series of contradictions, they successfully undermined Roberts' cost-based approach: not by overtly countering it, as Alexander and Manheim did, but rather by incorporating and then corrupting the logic at its core. The McHarg team transformed Roberts' method from a rational analysis of cost into an aesthetic performance of computation.

As with Alexander and Manheim, we might ask: what did the McHarg team gain from the tensions between quantification and immeasurability that his approach introduced? Was this gain also an environmental one? And, if so, what kind of environment *was* this? We might look towards McHarg's discussions of ecology for an explanation, since in the years surrounding the I-95 project, he described ecology as both a conceptual driver for design and a source of legitimation for the field of landscape architecture. By 1965, McHarg was firm and outspoken in his belief that by incorporating ecological principles the field of landscape architecture could develop a new relevance in both regional planning processes and society at large. He described ecology as a potentially all-powerful force, providing "the perception of form, an insight to the

[69] For a more extensive discussion regarding the purported objectivity of architectural diagrams, see Paul Emmons, "Diagrammatic Practices: The Office of Frederick L. Ackerman, and 'Architectural Graphic Standards,'" *Journal of the Society of Architectural Historians* 64.1 (2005), 4-21. For an STS-based discussion of representation and objectivity, see Lorraine Daston and Peter Galison, *Objectivity* (Zone Books, New York, 2007).

given form, [and] implication for the made form."[70] With its use, furthermore, "the caprice and arbitrariness of 'clever' designs can be dismissed forever. In short, ecology offers emancipation to landscape architecture."[71]

At a glance, we might link McHarg's complex resistance to Roberts' engineering-based approach to his opinion that ecology was, in essence, a better approach: more holistic, yet still satisfactorily quantitative. And indeed, if we only consider McHarg's spoken and written arguments, it is easy to connect his embrace of ecology to his frequent criticisms of highway engineers for failing to consider social and environmental issues.[72] Yet when considered in relation to technique and method, McHarg's embrace of ecology was itself full of contradictions. In discourse, McHarg specifically promoted scientific ecology as a source of comprehensive, objective solutions for design problems. And yet his "ecological" design innovations from this period drew very little on scientific approaches per se; as with the I-95 project's complicated incorporation of Roberts' economic analysis, despite McHarg's assertions to the contrary, ecology served more as inspiration than as a source of method.

McHarg presented his team's analysis and recommendation in early January 1966. In one week, he detailed the proposal at a Princeton Township meeting, discussed it at a state Division of Highways public meeting, and presented it in Washington D.C., where he drew on a connection with Lady Bird Johnson to gain audiences with the U.S. Department of Commerce and the Federal Highway Administrator.[73] Presenting at all levels of government proved highly successful, gaining significant visibility for the freeway controversy well beyond the local scene.

[70] Ian L. McHarg, "An Ecological Method for Landscape Architecture," *Landscape Architecture*, 57.2, (1967), 106.
[71] Op.cit., 105.
[72] For more on this issue see Chapter Five.
[73] McHarg would later recall, of requesting Johnson's assistance, "I decided to call Lady Bird Johnson. She was a fan of mine." McHarg, *A Quest for Life*, 186.

It also generated support for the McHarg plan at the federal level. When the state Division of Highways selected a different route, it became increasingly mired in disagreement among local, state, and federal levels, and failed to gain traction.[74] In the meantime, McHarg also leveraged the I-95 project for professional and disciplinary purposes as well: writing articles on the project for *Landscape Architecture Magazine* and *Highway Research Bulletin*, presenting it in November 1967 at a Senate Hearing on Urban Highways, and using its method as a template for another successful highway location study for Staten Island.[75]

As McHarg strategically presented the I-95 imagery in these contexts, the project's abstract, aesthetically ambiguous, and pseudo-objective qualities did successfully make space for a "non-cost" environmental perspective in governmental discourse. Indeed, it would seem that his combining of verbal invocations of scientific authority with categorical, multiply sourced, abstract, and purportedly objective drawings proved particularly effective in government forums: here bureaucratic frameworks not only privileged apparent quantification, but tended to take its outcomes, when presented confidently by experts, as fact. Extracting source data from government-produced maps reinforced this bureaucratic amenability, making it all the more likely that McHarg's imagery would be seen as factual in governmental contexts, regardless of underlying contradictions. McHarg's use of economic and scientific jargon also reinforced the project's disciplinary and political efficacy: both performing the under-recognized field of

[74] McHarg's biography is the best single source regarding this political effectiveness; in it he also reviews the I-95 project's governmental reception. However, McHarg's narratives are exaggerated in several places in the book, and are sometimes factually inaccurate. Therefore I do not use precise details from his accounts here, except when the information is verifiable through other sources. McHarg, "Where Should Highways Go?"; McHarg, "A Comprehensive Highway Route Selection Method"; *Urban Highways: Hearings before the United States Senate Committee on Public Works, Subcommittee on Roads, Ninetieth Congress, First Session, on Nov. 14-16, 28-30, 1967* (Washington: U.S. G.P.O., 1967), 58-63; McHarg, *A Quest for Life*, 183-189.

[75] For a detailed critical reading of the Staten Island project see Patrick Nugent, "From the Richmond Parkway to the Staten Island Greenbelt: The Rise of Ecological Zoning in New York City," *Journal of Planning History* 16.2 (2017), 139-161.

landscape architecture as a realm of expertise, and suggesting that nascent environmentalist concerns had basis in solid fact.

Precisely because of its internal contradictions, McHarg's I-95 project and the "environmental design" approach that would soon grow out of it calibrated and distributed the very acts of defining environments in ways that made them more available for governmental protection. The highway environment propagated by McHarg's team appeared, at a glance, to be a cleanly functioning, frictionless, strictly quantifiable system; yet its internal contradictions made it unstable and uncertain. McHarg's team exploited those very contradictions in order to engage the highway on environmental terms; but in an entirely different way, and towards an entirely different end, than Alexander and Manheim had done. While Alexander and Manheim tempered computation with drawing in order cultivate visions of environmental uncertainty and emergence, McHarg introduced and exploited tensions between rhetoric, method, and technique for the purpose of strategic elision, performance, and positioning. Rather than mining tensions between quantification and immeasurability as manifestations of environmental holism or natural force, McHarg's team exploited them for environmental *activism*: in support of tactical moves at once public, controversial, and political.

The I-95 project cultivated a representational corollary to McHarg's promotion of ecology: imbuing design drawing with an engineering-based concern for technical precision via methods and techniques that maintained close fidelity to source data; and cultivating the designer/nature relationship as a matter of precise marking, distributed production, and detached analysis. At the same time, this approach was less scientific than described, and less technological than it appeared: cultivating an aesthetic of facticity whose internal misalignments served a range of pragmatic political purposes. Supposed objectivity made this approach effective in governmental

forums, while taking aesthetic liberties with that objectivity carved out space within an otherwise technocratic process for engaging natures on ideological and political terms. Essentially performative, visually persuasive, and politically effective, this emerging approach to defining landscapes at large scales simultaneously redefined designer/nature relationships on circumscribed and delimited terms, and expanded environmental concerns into broader governmental and interdisciplinary discussions.

Conclusion

By the late 1960s, Roberts' approach to highway location had evolved in several ways. In a 1966 MIT Research Report, Roberts and fellow MIT researcher John Suhrbier outlined their recent computer-based research on highway location work. In the Introduction, the authors implicitly acknowledged the nationwide freeway debates by acknowledging highways' "economic, social, aesthetic, and political impact."[76] Despite this comment however, their method continued to focus on calculating cost, now using computers in all phases of the process (Figure 4.22). As part of this system, the authors described a digital terrain data recorder: a manually-operated computerized scanner that would record topographic data in bands, thus efficiently transforming the topographies of potential highway locations into values whose earthwork costs could be easily calculated by computer (Figure 4.23). As this work demonstrates, highway engineers continued to evolve methods for computerizing highway landscapes and automating drawing processes through the 1960s; they also continued to be somewhat circumspect with regards to non-quantifiable highway location factors.

[76] Paul O. Roberts and John H. Suhrbier, *Highway Location Analysis: An Example Problem* (The M.I.T. Press, 1965), 3.

As in earlier chapters, these highway projects advanced environmental design agendas that would become much more apparent and defined in just a few years' time. Alexander, Manheim, and McHarg would all continue to promote environmental approaches throughout their later work. Despite innovations in computer graphics, both Alexander and McHarg would continue to use hand-drawing techniques to do so. Alexander would continue exploring diagramming as a means of solving ecological issues, but he would shift away from large-scale site design and planning towards more strictly architectural analyses. He became part of the architecture faculty at University of California Berkeley in 1963, thus joining a Bay Area cohort of like-minded late-modernist environmentalist designers whose design work would continue tying together creative practice, ecological awareness, and cultural vanguardism in the coming years.[77] Manheim also continued extending the hybridly digital and environmental discussion that he and Alexander explored in the 1960s, though not on visual terms. He would conduct research in environmental approaches to highway engineering as a professor at MIT, working in the 1970s with the EPA on evaluating highway-area air quality, and with the Federal Highway Administration on environmental approaches to transportation planning.[78] McHarg would go on to practice and promote the I-95 approach as the "layer cake method," a tool for determining the ecological value of land. He would become a central figure in the environmental movement in the 1970s.[79]

The Alexander/Manheim and McHarg projects, meanwhile, would influence architects, planners, and urban designers on several fronts at once, including freeway design, environmental planning, and digital mapping. The Alexander and Manheim project appeared in a 1963 special issue of *Architectural Forum* on highways, and would become a familiar to many designers

[77] See Chapter Five.
[78] Box 6, Marvin Manheim Papers, MIT Institute Archives.
[79] McHarg, *A Quest for Life*, 207-296.

working in environmental planning and computer-based land analysis in the years to follow.[80] The McHarg team's second highway location project for Staten Island would become a cornerstone case study in his 1969 best-selling environmentalist text, *Design with Nature.* The I-95 project's additive, layered inventory method would become the central to McHarg's professional work, and to landscape and planning education at the University of Pennsylvania. He would train several generations of designers in what he referred to as "layer cake" techniques; many of these students would contribute to the development of environmental planning and GIS, and influence the field of landscape architecture for the following decades.[81] Today many designers still refer to this approach – however obfuscatingly – as "the McHarg method."

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[80] The project would also influence the book *The Freeway in the City*: See Chapter Five. Bernard P. Spring, "Technology: Methods and Machines to Shape the Future," *Architectural Forum* 10 (1963), 88-93. Steinitz, Parker, and Jordan, "Hand-drawn Overlays."

[81] The students of McHarg's who would contribute to environmental approaches to the field of landscape architecture in later years are numerous. Two examples relevant here are authors of significant texts on urban ecology: Anne Whiston Spirn, author of *Granite Garden: Urban Nature and Human Design* (1985), and Michael Hough, author of *City Form and Natural Process* (1984). The influence of highway location methods on the development of GIS technology, meanwhile was likely significant. However, its influence is difficult to track, as this technology developed in several places at once: among different groups, at different institutions, and in different countries. As J.T. Coppock and David Rhind put it, the first phase of GIS development in the US, from the 1950s to the mid 1970s, "was characterized by individual – even idiosyncratic – developments, limited international contacts, little data in machine-readable form and ambitions which far out-ran the computing resources of the day." Because of these early conditions, many different individuals are today credited for breakthroughs that were not solely their own. For example, in a brief history of overlay methods in environmental applications, Steinitz, Parker, and Jordan assert that the Alexander and Manheim project was the first instance of superimposing and weighting various overlay maps together, while Jack Dangermond, an early mid-1960s participant in the Harvard Laboratory for Computer Graphics and 1969 founder of the Environmental Systems Research Institute (ESRI), has publicly credited McHarg with inventing the map overlay. Roger Tomlinson, meanwhile, was developing GIS programs in parallel with Harvard and other institutions, as part of the Canada Land Inventory. In summary, while these projects unquestionably contributed to the evolution of what is today ESRI-GIS, their influence was one early factor among many. Anne Whiston Spirn, *The Granite Garden: Urban Nature and Human Design* (Basic Books, 1985); Michael Hough, *City Form and Natural Process* (London: Croom Helm, 1984); Coppock and Rhind, "The History of GIS"; Steinitz, Parker, and Jordan, "Hand-drawn Overlays"; "Dangermond Introduces McHarg, ESRI International User Conference 1997," YouTube. https://www.youtube.com/watch?v=5HkhTxyZNT4 (last accessed July 27, 2017); Roger F. Tomlinson, "The Impact of the Transition from Analogue to Digital Cartographic Representation." *The American Cartographer* 15.3 (1988), 249–262.

By the mid-1970s, the impacts of this increasingly digitized mapping method on hand drawing were clear. Promoting a computer-inspired "data file" mapping method that could sort large amounts of landscape information, Harvard-based landscape architecture professor Carl Steinitz and co-authors expressed disdain for hand-drawing's role in engaging natural processes. Likening hand drawing to the play of children, they criticized its excessive cost and proclaimed that, with the computer's advance, "the days of drawing board drudgery are numbered."[82] In this sense, the highway projects discussed here would catalyze an approach to designer/nature relationship defined not by thinking-while-drawing, but rather by the arrangement, tracing, and computation of landscape data.

Clearly, these highway location approaches would continue to evolve beyond their 1960s iterations. But just how we understand the projects' ramifications depends a great deal on how closely we examine their techniques and methods. At a glance, these projects seem to reinforce a reading of late modernism as a period when new technologies were deployed towards more objective, rational ends. Both the Alexander/Manheim and McHarg projects imported an engineering-based computational approach into design fields, and both projects attempted to split drawing and decision-making apart, in contrast to prior practices. As such, they marked steps towards reducing the role of drawing in design decision-making. Each attempted this separation in a different way, with notably different effects. Alexander and Manheim computerized decision-making methods while using hand-drawn sketches that positioned the designer as a creative mediator of immanent site qualities. McHarg altered drawing technique: minimizing the use of hand drawing as a means for decision-making, maximizing the use of government-produced data, and prioritizing precision and standardization in image-making.

[82] Steinitz, Parker, and Jordan, "Hand-drawn Overlays."

And yet when these projects' techniques and methods are closely scrutinized, a straightforwardly techno-social reading falls apart. In practice, the design adaptations of Roberts' precedent deployed technology and rationality in complex and subtle ways, and resisted aspects of Roberts' approach. Some of these resistances were overt: in writing and presentations, both teams argued that Roberts' focus on cost constituted a highly problematic reduction of the highway site. Others were tacit: in their drawing and making processes, each team countered Roberts' methodological precision by integrating different uncertain, aesthetic, performative, and ambiguous qualities into their design practices and representations.

The specific ways that each team complicated Roberts' method were different, as were the outcomes. Alexander and Manheim mixed computer-based problem solving with responsive, open-ended hand drawing. They thus engaged both their subject and its site on markedly inclusive and relationally nuanced terms. Much like the authors of *View from The Road*, Alexander and Manheim manifested a private, personal politics in their work: extending earlier modernist understandings of spatial experience and natural form to cultivate a sense of the designer as a mediator of technological constructions and natural forces in the world. The outcome was a unique model for extending interrelational and situated aspects of modernist design practices towards new uses at very large scales.

McHarg's adaptation appeared more technological and objective than the Alexander and Manheim version; yet it used no new technologies, and its embraces of quantification and science were largely rhetorical, performative, and aesthetic. There were numerous contradictions in the McHarg team's approach – between rhetoric and practice, between performance and method, between aesthetic and analytical precision. The very success of these contradictions in governmental forums supported a shift in design practice: a move away from approaches that

were private matters of cultivating responsive attunement within design process. In their place, the McHarg team promoted technique and method as matters of *public* politics: strategic maneuvering relative to a rapidly expanding environmental bureaucracy in which defining living sites as measurable, definable, and quantifiable made them visible to legislators, and therefore governable.

Both these adaptations involved internal contradictions regarding whether or not it was possible to reduce site analysis and design to purely quantitative measures. In the broader context of 1960s freeway controversies and environmental politics, these very contradictions served to open up new trajectories in design relative to larger scales, emerging technologies, and newly politicized sites. These contradictions generated productive instabilities: making the complexities of large landscape sites more apparent, and critically altering highway location method so that it would allow for more environmental perspectives and actions. That fact that such instabilities *were* productive at this time epitomizes the era's broader tensions regarding design techniques, natures, and technologies; revealing a complex 1960s connection between tacitly resisting reduction within design practices, and making a space for environmental issues in interdisciplinary and governmental contexts.

In a way then, the evolution in technique and method that emerged through the migration of Roberts' highway location method resulted in a markedly more public role for environmental visions. And yet this is a good moment to recall the comic with which this chapter began: for the same qualities that made McHarg's publicly-deployed version of the highway location method particularly available for public activism also made the drawings strangely, markedly, opaque. Ostensibly informative and objective, their underlying methods and logics were nonetheless

veiled and buried in misrepresentation and internalized processes; they therefore remained, in a sense, highly private, even as they appeared available to discourse.

No design drawings are purely or wholly public in nature – they are products of skilled, trained activity, and therefore inevitably partly unavailable to "layman" understanding. What is significant here, however, is McHarg's implicit suggestion that design drawings could be and should be tools within public process. Despite the drawings' supposed objectivity and precision and therefore their usefulness as markers of expertise and fact in public forums, it seems likely that ultimately the drawings themselves were of less importance in the I-95 controversy than McHarg's connections to Lady Bird Johnson and his savvy maneuvering in Washington D.C., as well as the Princetonians' own political clout and know-how.

In this light, we might ask to what degree the McHarg team's drawings ultimately mattered at all. Was the work of the drawings, once they were deployed in political process, more to be mute than to speak? Was it more useful, in the context of public/governmental wrangling, for them to elide and symbolize than to inform, reveal, or elucidate? These important – if not entirely resolvable – questions will emerge again in the closing chapter, as design drawing, confronted once again with governmental process and an increase in scale, shifted even further towards signification.

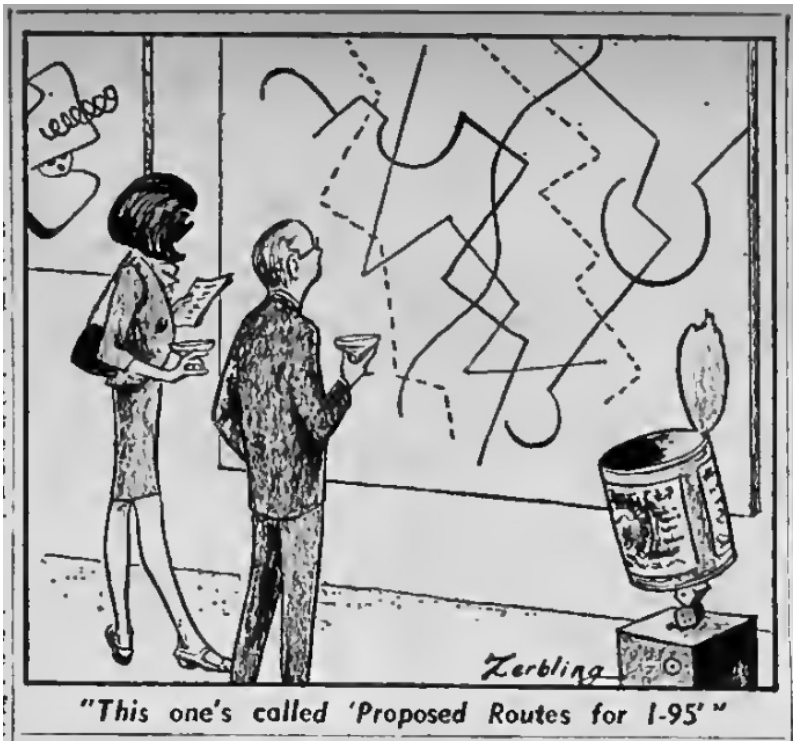

Figure 4.1. Comic regarding controversy in Princeton, NJ over proposed routing for I-95. Town Topics, March 17, 1966, 1.

Figure 4.2. Map showing areas where portions of Interstate 95 remained unbuilt in 1970. Donald Janson, "Expressway Construction Lags As Officials Heed Urban Outcry," The New York Times, Feb 15, 1970.

Figure 4.3. An example cost analysis map for one factor, as defined in Paul O. Roberts' thesis. Paul O. Roberts, "An Integrated System of Highway Location Analysis Using and Electronic Computers," Thesis (Massachusetts Institute of Technology, 1957), 28.

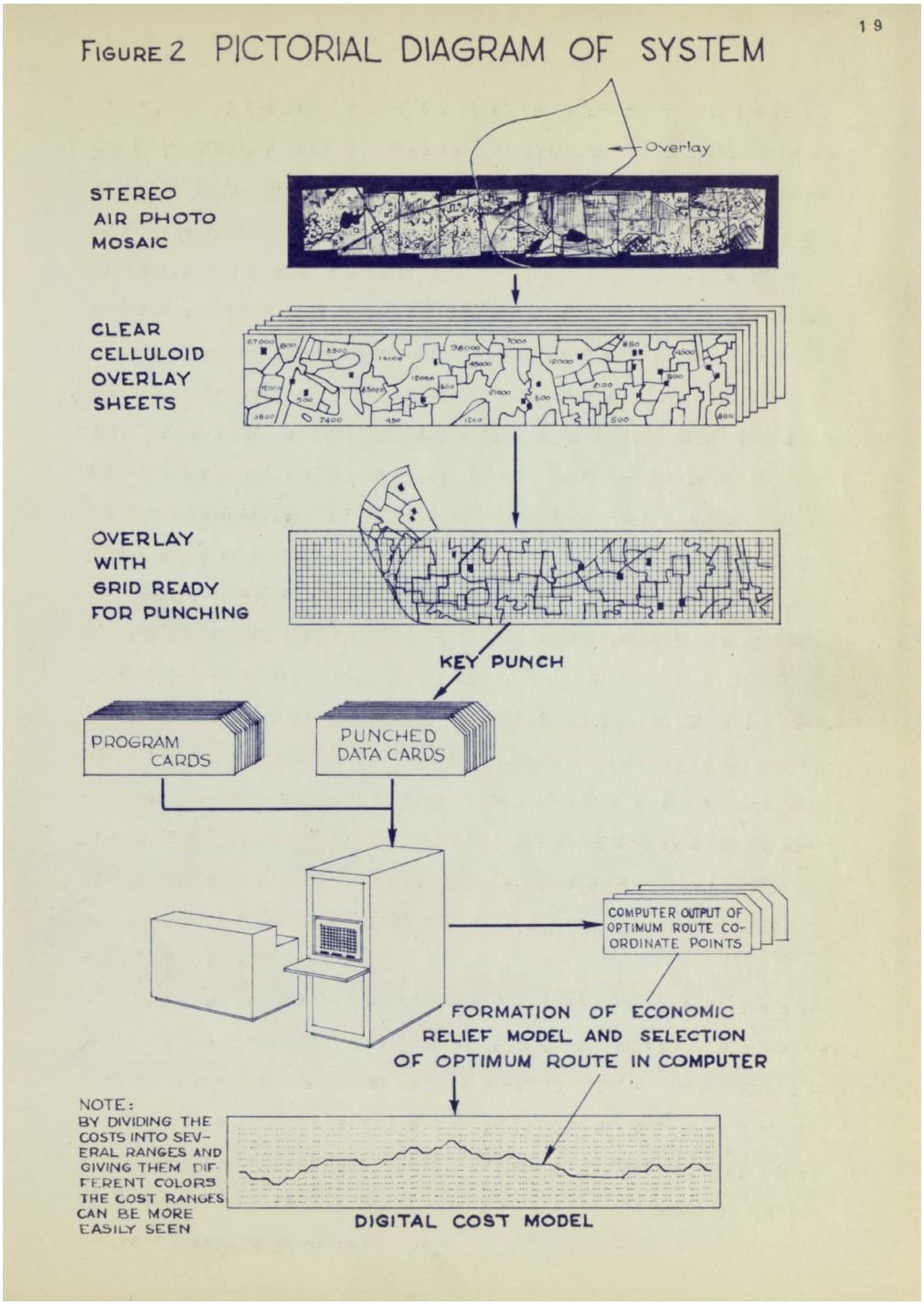

Figure 4.4. Roberts' explanatory diagram of the proposed location method. Roberts, "An Integrated System of Highway Location Analysis Using and Electronic Computers," 19.

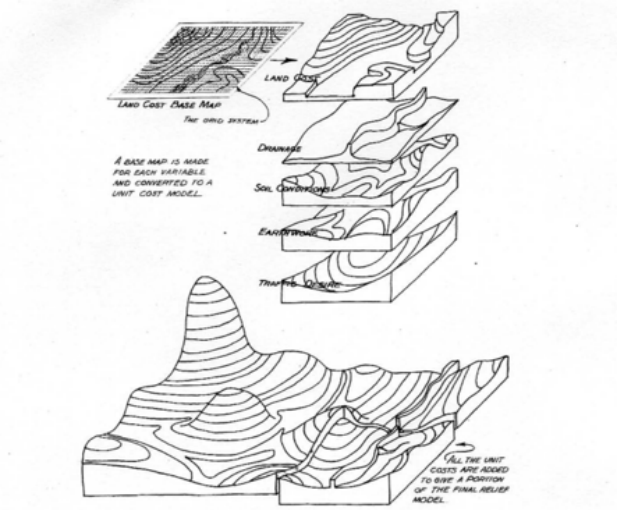

FIG. 2. Final economic relief model.

Figure 4.5. Roberts' proposed relief model based on calculations of highway cost per square foot. Paul O. Roberts, "Using New Methods in Highway Location," *Photogrammetric Engineering* 23:3 (1957), 567.

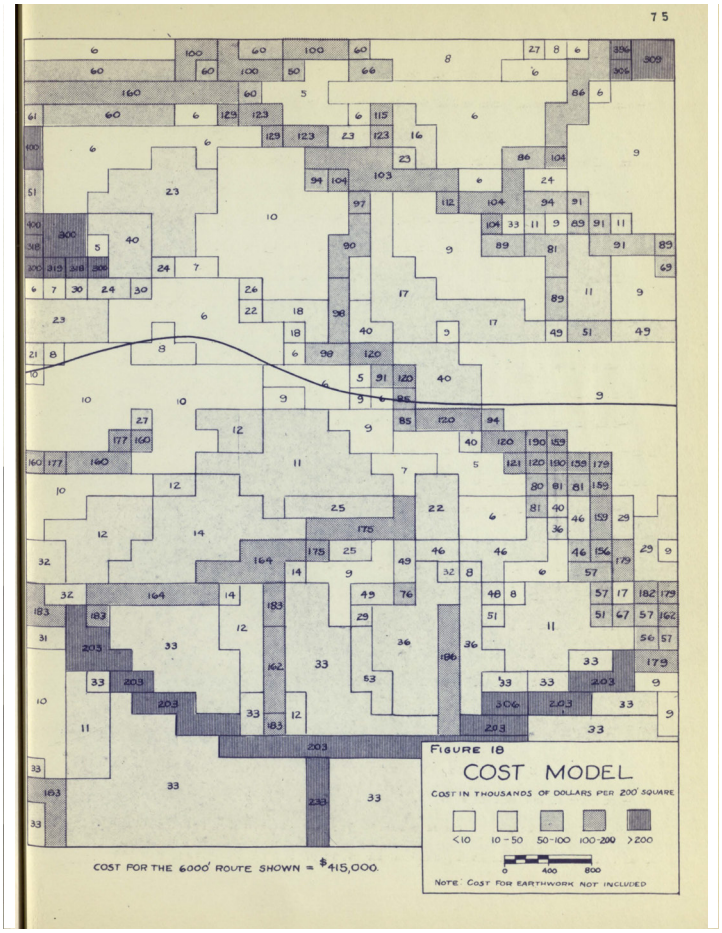

Figure 4.6. Roberts' alternative to the relief model: a composite map with different tones representing different levels of highway cost. Roberts, "An Integrated System of Highway Location Analysis Using and Electronic Computers," 75.

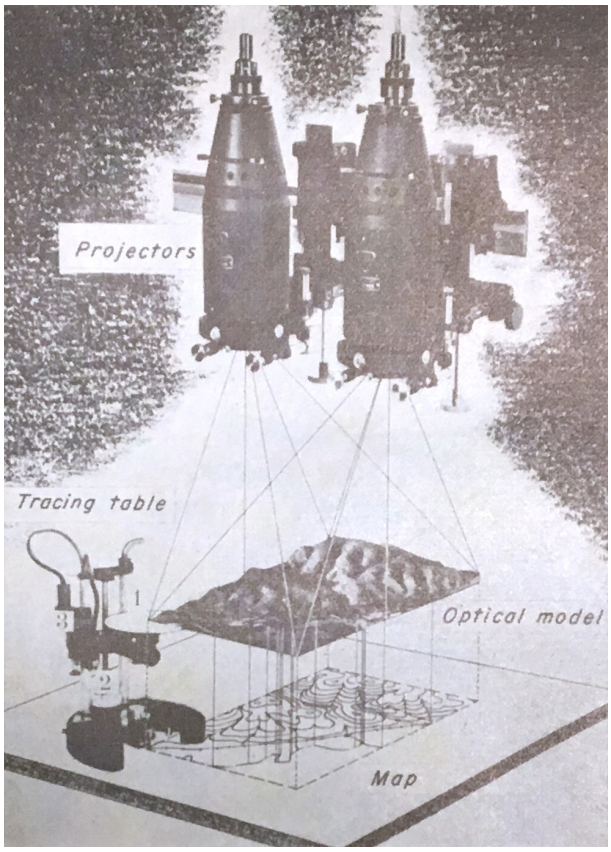

Figure 4.7. Illustration of an arrangement of tools for stereoscopic projection and tracing. Bertil Hallert, *Photogrammetry: Basic Principles and General Survey (*New York: McGraw-Hill, 1960), 7.

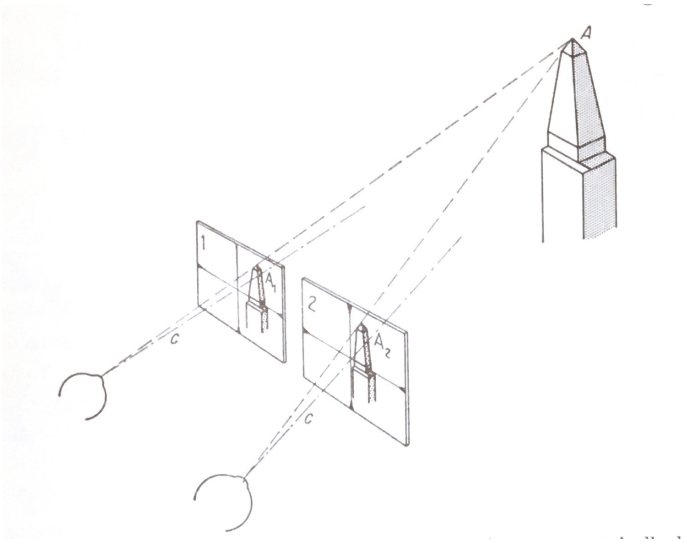

Figure 4.8. Diagram of the optics of stereoviewing (note two eyes shown at lower left). Hallert, *Photogrammetry*, 57.

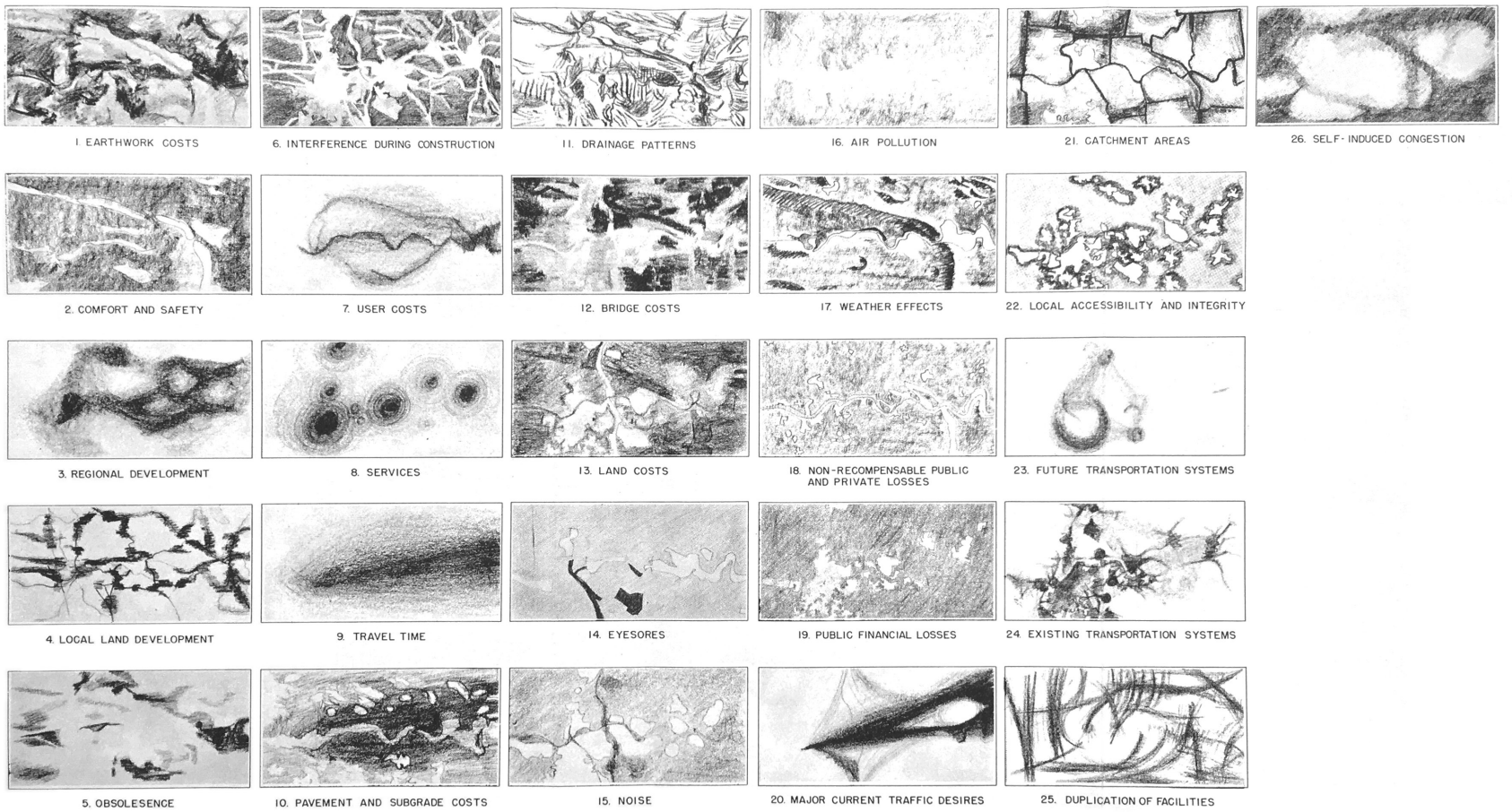

Figure 4.9. The 21 requirements used in Alexander and Manheim's highway location study: Earthwork Costs, Comfort and Safety, Regional Development, Local Land Development, Obsolescence, Interference During Construction, User Costs, Services, Travel Time, Pavement and Subgrade Costs, Drainage Patterns, Bridge Costs, Land Costs, Eyesores, Noise, Air Pollution, Weather Effects, Non-Recompensable Public and Private Losses, Public Financial Losses, Major Current Traffic Desires, Catchment Areas, Local Accessibility and Integrity, Future Transportation Systems, Existing Transportation Systems, Duplication of Facilities, and Self-Induced Congestion. Christopher Alexander and Marvin L. Manheim, *The Use of Diagrams in Highway Route Location: An Experiment* (School of Engineering, Massachusetts Institute of Technology, Cambridge, Mass, 1962), 7.

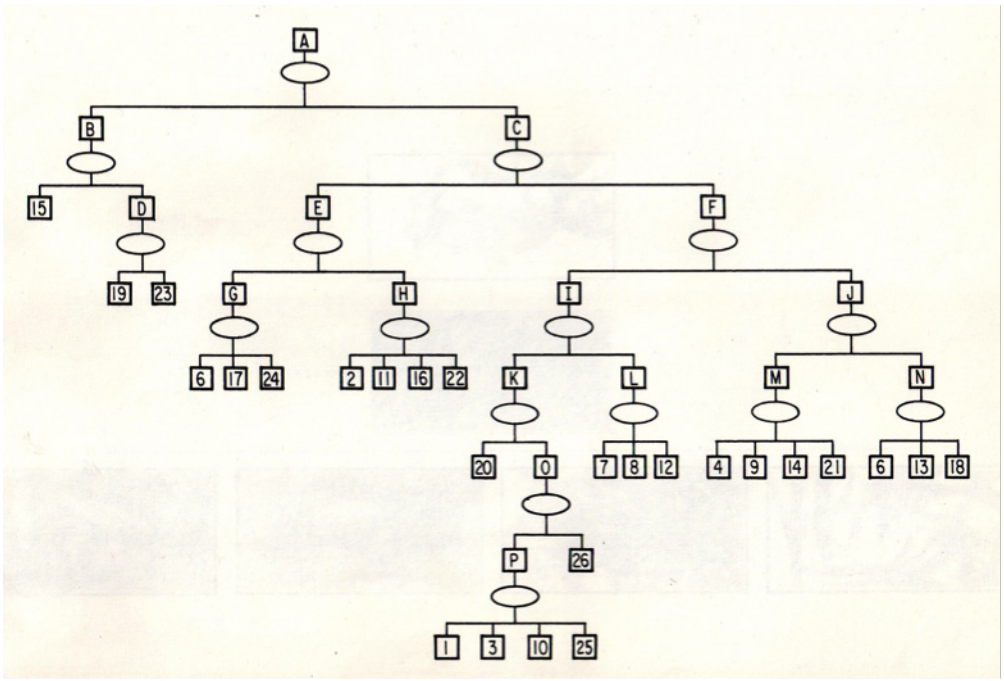

Figure 4.10. Diagram showing how the 25 requirement drawings were cross-referenced in nested series, eventually resulting in a single location recommendation (diagram A, at top). Ovals represent interpretive drawings that distilled the information contained in composite images of multiple requirements. Alexander and Manheim, *The Use of Diagrams in Highway Route Location*, 9.

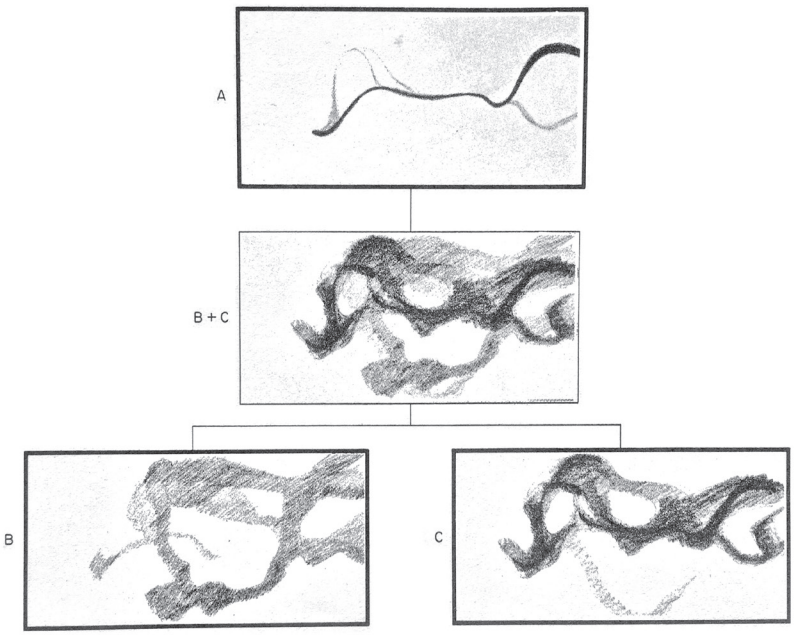

Figure 4.11. Diagram showing the final recommended highway location (A, top), as well as the two path drawings (B, C) used to determine the final solution. Alexander and Manheim, *The Use of Diagrams in Highway Route Location*, 21.

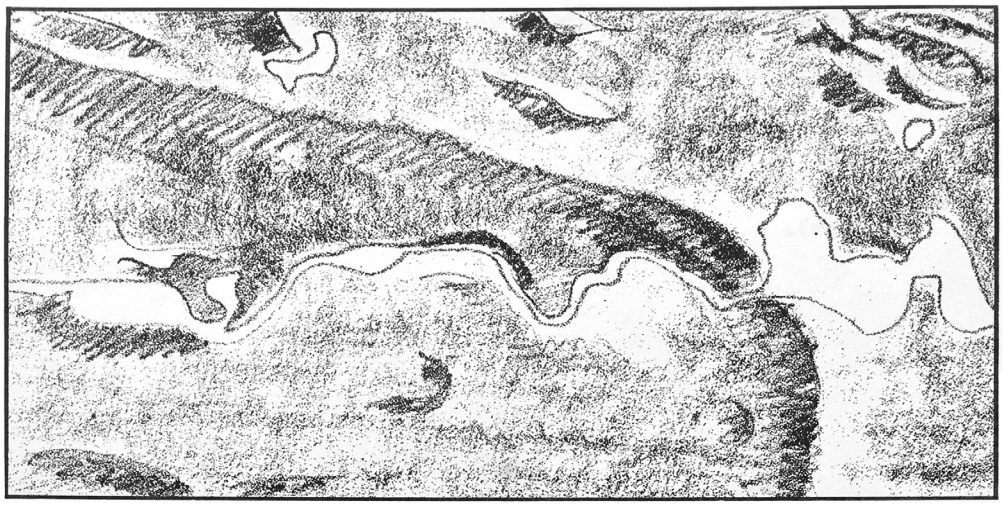

Figure 4.12. Requirement 17, "Weather Effects" diagram. "This requirement is concerned with the vulnerability of the highway to the effects of weather conditions: floods, snowdrifts on the windward sides of hills, ice on the pavement in the shadows of cuts and underpasses, fog in dips of the road into marshy hollows, unbroken crosswinds, smoke from local conditions, etc." Alexander and Manheim, *The Use of Diagrams in Highway Route Location,* 7.

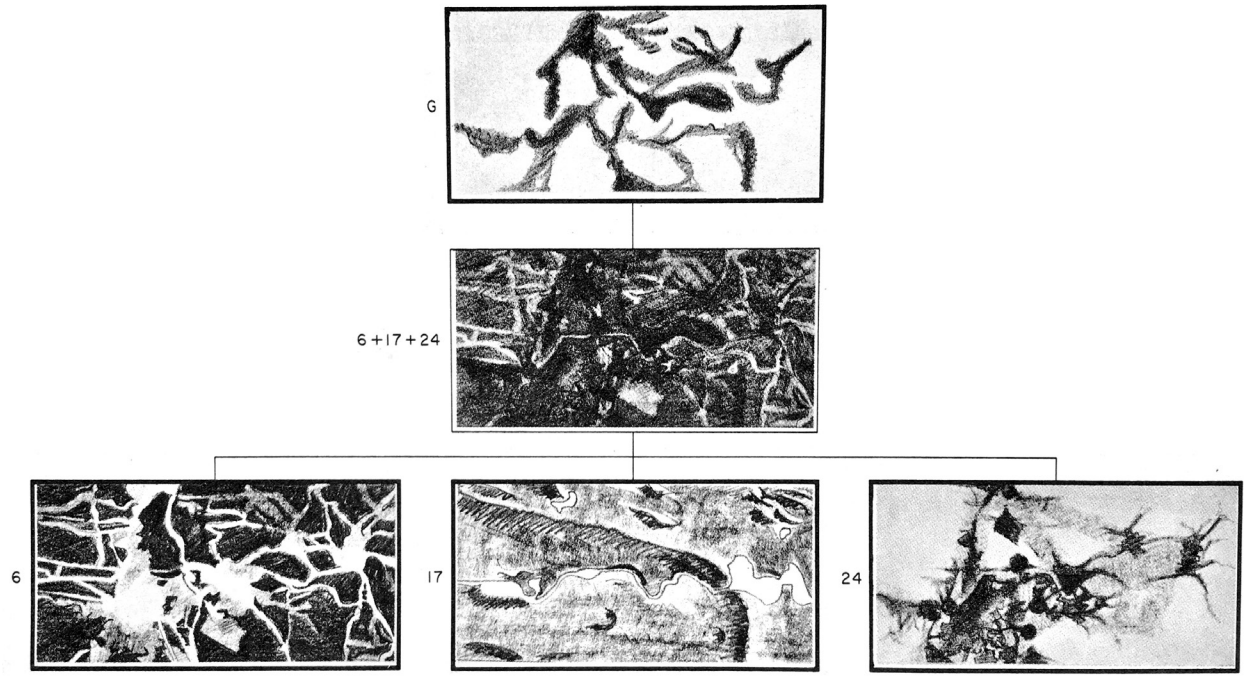

Figure 4.13. Diagram showing the overlay and path drawing process for requirements 6 (Interference During Construction), 17 (Weather Effects), and 24 (Existing Transportation Systems). "6+17+24" shows the overlay image of the three requirements; G, at top, is the path diagram marking the darkest areas seen in the overlay image. Alexander and Manheim, *The Use of Diagrams in Highway Route Location,* 17.

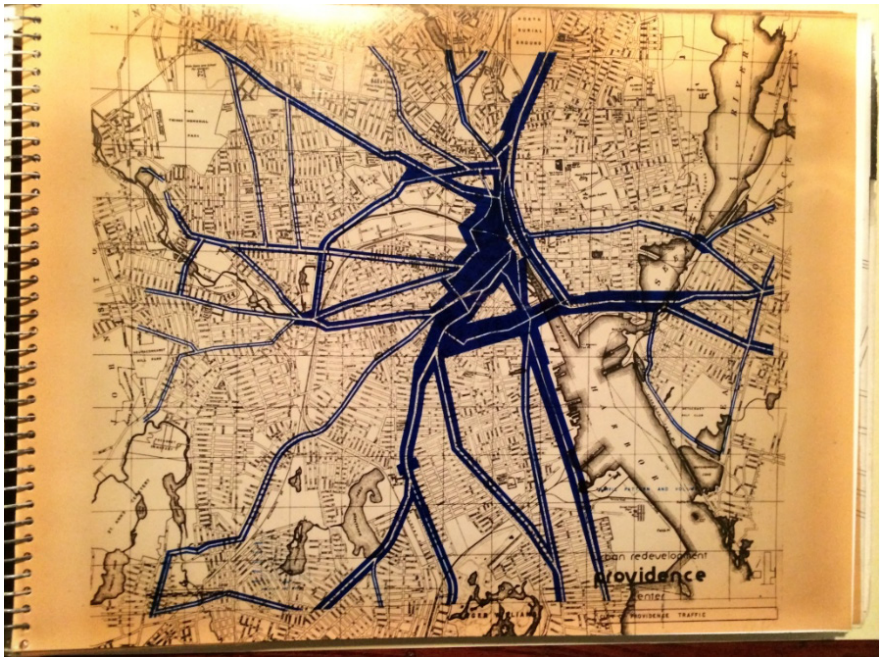

Figure 4.14. Diagram of existing traffic volumes in Providence, RI. William Conklin, Robert L. Geddes, Ian McHarg, and Martin Sevely, Thesis, 1950. Ian L. McHarg Papers, Architectural Archives of the University of Pennsylvania.

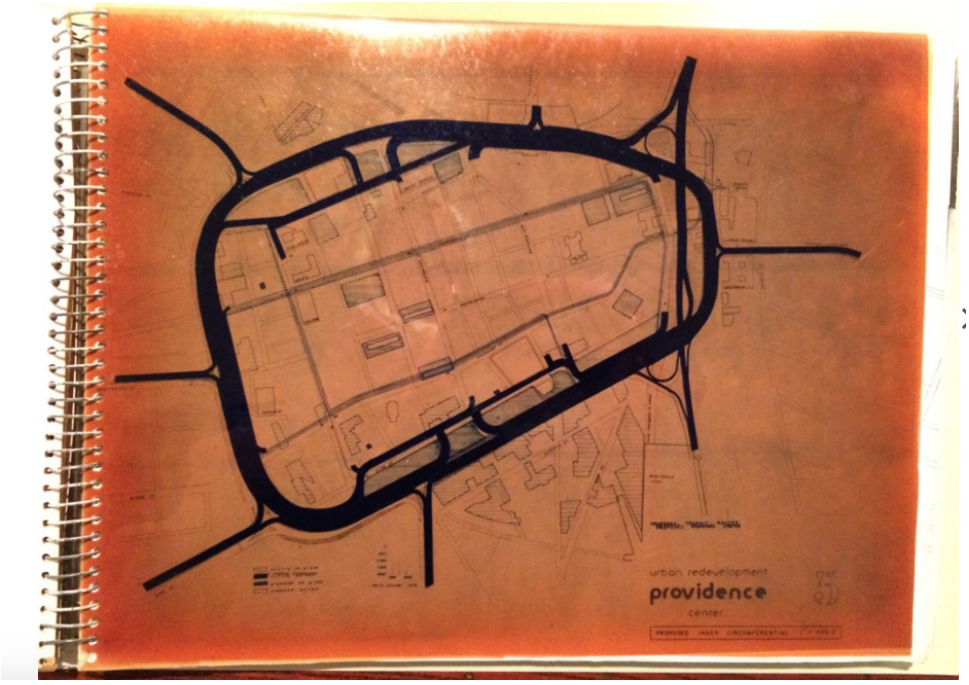

Figure 4.15. Proposed redevelopment for the urban center of Providence, RI. William Conklin, Robert L. Geddes, Ian McHarg, and Martin Sevely, Thesis, 1950. Ian L. McHarg Papers, Architectural Archives of the University of Pennsylvania.

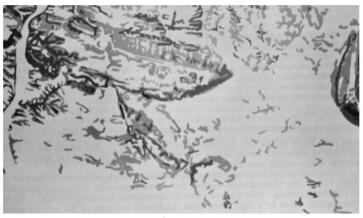
Figure 1. Topography.

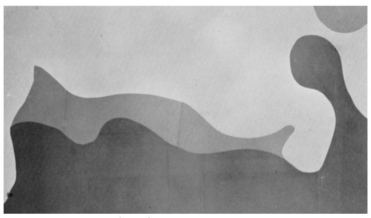
Figure 2. Land values.

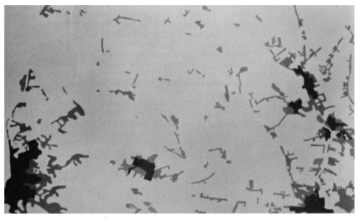
Figure 3. Urbanization.

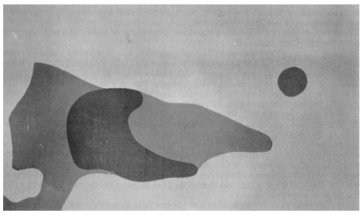
Figure 4. Residential quality.


Figure 5. Historical value.

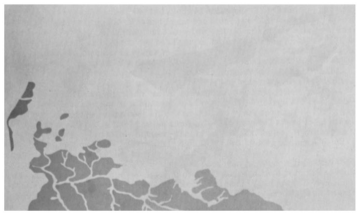
Figure 6. Agricultural value.

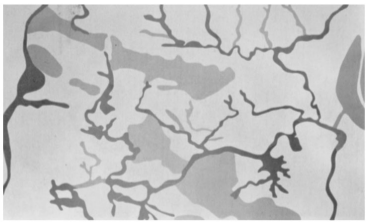
Figure 7. Recreational values.

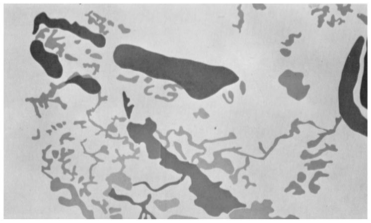
Figure 8. Wildlife values.

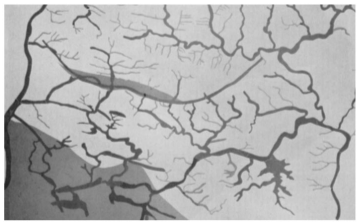
Figure 9. Water values.


Figure 10. Susceptibility to erosion.

Figure 4.16. The ten factors included in the McHarg team's I-95 location analysis, combined into one image by the author. Factors are Topography, Land Values, Urbanization, Residential Quality, Historical Value, Agricultural Value, Recreational values, Wildlife Values, Water Values, and Susceptibility to Erosion. Images arranged by author. From Ian L. McHarg, "A Comprehensive Highway Route Selection Method," *Highway Research Record* 246, 6-12.

Roberts	Alexander and Manheim	McHarg
Earthwork	Earthwork Costs	Topography
Soil Conditions	Pavement and Subgrade Costs	Suceptibility to Erosion
	Comfort and Safety	
	Regional Development	Urbanization
	Local Land Development	Residential Quality
	Obsolescence	
	Interference During Construction	
	User Costs	
	Services	
	Travel Time	
Hydrologic Conditions	Drainage Patterns, Bridge Costs, Catchment Areas	Water Values
	Eyesores	
	Noise	
	Air Pollution	
Land Cost	Land Costs	Land Values
Weather	Weather Effects	
Land Use	Non-Recompensable Public and Private Losses	Historical Value
Need to Relocate Existing Utilities	Public Financial Losses	Agricultural Value
	Local Accessibility and Integrity	Recreational Values
Traffic Desire	Major Current Traffic Desires	Wildlife Values
	Future Transportation Systems	
	Existing Transportation Systems	
	Duplication of Facilities	
	Self-Induced Congestion	

Figure 4.17. A chart by the author, comparing the parameters used in each of the highway location projects discussed in this chapter.

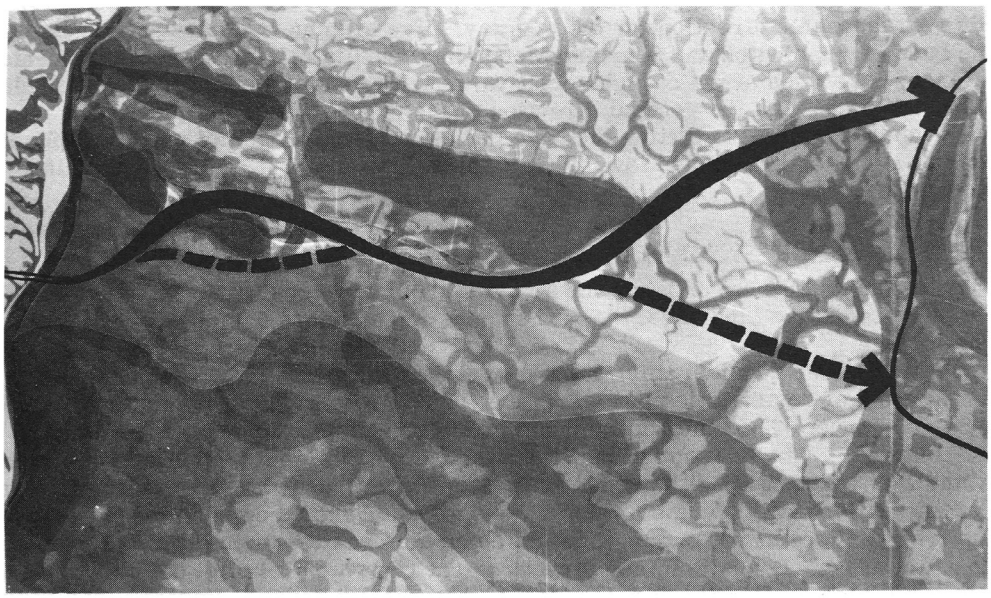

Figure 12. Least social cost alignment corridor.

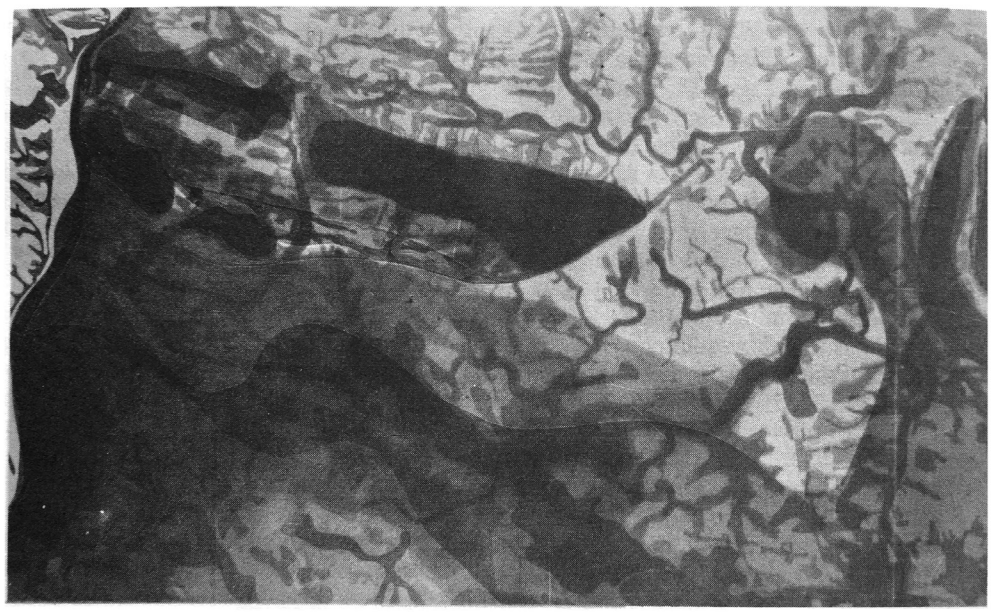

Figure 11. Composite of all values in the area.

Figure 4.18. Final composite image (top) and proposed highway path overlain on the composite image (bottom), I-95 location analysis, arranged by the author. McHarg, "A Comprehensive Highway Route Selection Method," 12-13.

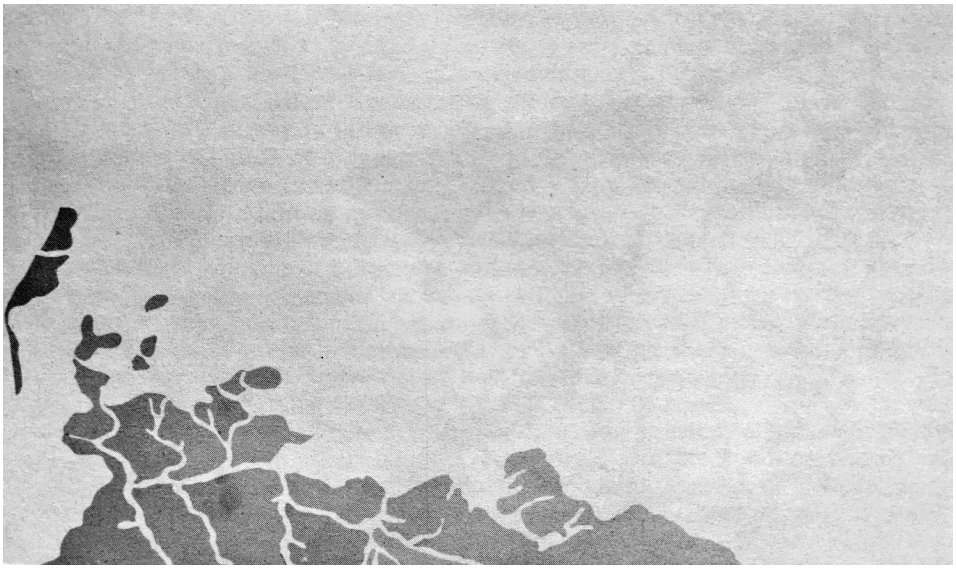

Figure 4.19. "Agricultural Value" map, I-95 project. McHarg, "A Comprehensive Highway Route Selection Method," 9.

Figure 4.20. Students coloring a plan drawing in a landscape architecture studio, 1971. Slide Collection, Curriculum Documents and Student Work, 1958-1999, The Architectural Archives of the University of Pennsylvania.

Figure 4.21. Students working in studio with prior years' drawings hanging on the wall for reference, 1971. Slide Collection, Curriculum Documents and Student Work, 1958-1999, The Architectural Archives of the University of Pennsylvania.

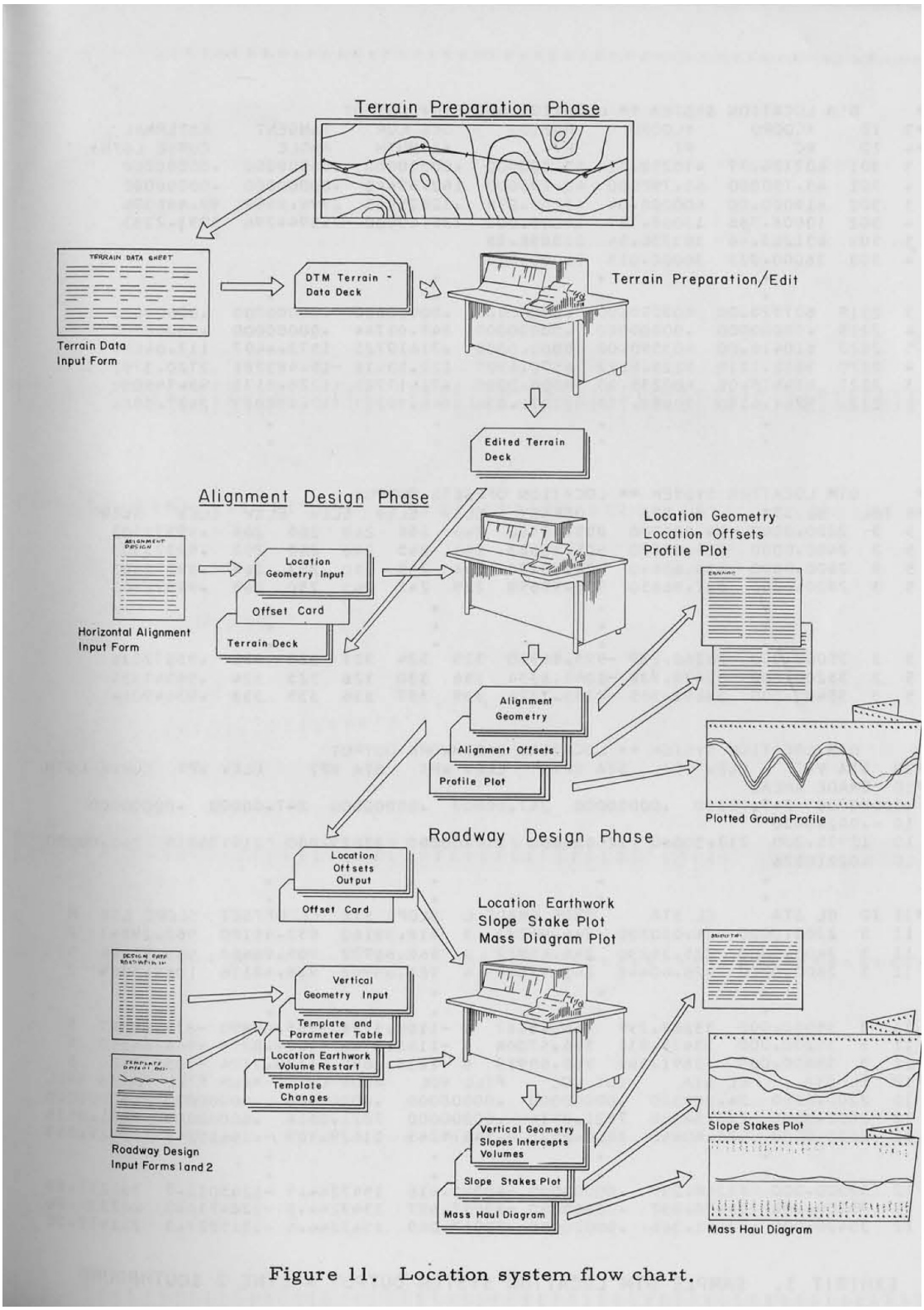

Figure 4.22. Roberts' and Suhbrier's 1966 outline of the recommended highway location process (compare to Figure 4.2). Paul O. Roberts and John H. Suhrbier, "Highway Location Analysis: An Example Problem" (MIT Report No. 5, 1966), 27.

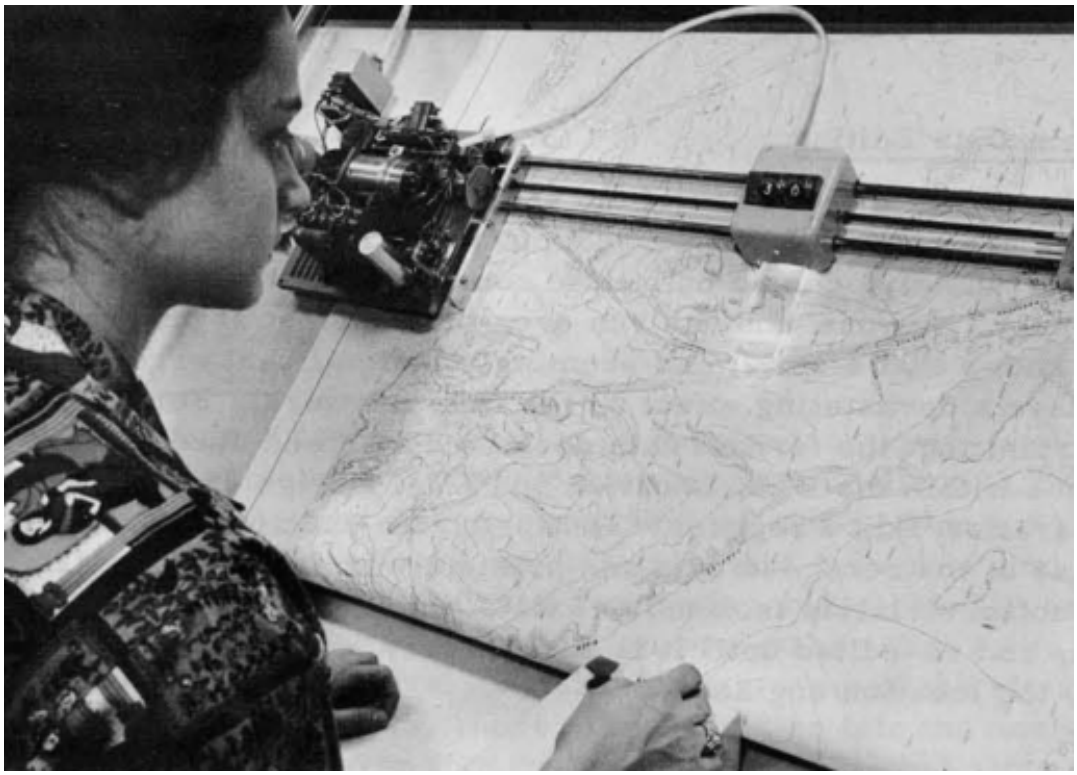

Figure 4.23. Drawing using an area calculation computer. Roberts and Suhrbier, "Highway Location Analysis," 23.

CHAPTER FIVE

SYSTEMATIC INTUITION?
REPRESENTING ENVIRONMENTAL EXPERTISE IN *THE FREEWAY IN THE CITY*

"An expressway is a major line of force. It must be skillfully resolved."[1] So wrote landscape architect John Ormsbee Simonds in January 1966, at the first meeting of the Federal Highway Administration's (FHWA) board of Urban Advisors. The convener of this group was Rex H. Whitton, the head of the FHWA; the purpose, to invite designers and planners to instruct highway engineers and government officials in "improv[ing] the performance, appearance, and acceptance of urban freeways."[2] Whitton asked landscape architect Michael Rapuano to lead the board, which included Simonds, landscape architect Lawrence Halprin, structural engineers Thomas Kavanagh and Harry Powell, architect Kevin Roche, and city planners Matthew Rockwell and Marvin Springer. Over the following two years the advisors would meet, visit freeway sites, read relevant literature, exchange and critique each other's writings, and collect and produce photographs, sketches, and diagrams relating to freeway issues and ideals. The outcome of this work would be *The Freeway in the City* (FITC), a book intended to provide government officials and engineers, design professionals, and laypeople with guiding principles regarding how to best legislate, plan, and design urban freeways.[3]

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[1] "Notes of the January 26 Meeting," Box 149, Agendas, Minutes, John Ormsbee Simonds Collection, Special & Area Studies Collections, University of Florida George A. Smathers Libraries.
[2] Ibid.
[3] Edward Muller has written a brief overview of the advisors' process, which also details Simonds' later freeway work. Edward K. Muller, "Acceptably Pleasing: The Urban Advisors and the Struggle to Improve Freeway Design," *Journal of Urban History* 40 (2014), 894-916.

In 1966, under the weight of protests, efforts to build freeways were faltering in cities throughout the United States.[4] Engineers, designers, and planners had been actively debating the siting and design of freeways for at more than a decade: locally, in print, and at state and federal conferences.[5] As controversies and disciplinary discussions accumulated in the late 1960s, however, highway engineers found themselves embroiled in heightened conflict regarding how freeways should be planned and built: receiving relentless criticism from protesting locals, and from designers and planners as well.[6] If landscape architects, urban planners, and architects were frustrated that they had been excluded from freeway design projects, state highway engineers were equally upset by the mounting intensity of local and professional opposition to their freeway building efforts.[7]

As urban freeway controversies continued to multiply and gain intensity, various bodies within the federal government began to shift their stances on local power with regards to freeway

[4] See, for example, "Highways vs. People," *New York Times*, November 20, 1966; *Urban Highways: Hearings before the United States Senate Committee on Public Works*.

[5] For more on preceding national conferences on urban freeway design and planning, see *The Sagamore Conference on Highways and Urban Development: Guidelines for Action* (Syracuse, N.Y.: Syracuse University, 1958); *Freeways in the Urban Setting: The Hershey Conference* (Washington: Automotive Safety Foundation, 1962); *Highways and Urban Development: Report on the Second National Conference, Williamsburg, Va.* (American Association of State Highway Officials, National Association of Counties, National League of Cities, 1966). For an example of the complex ways that hired architects and planners sometimes became embroiled in local controversies, see Sidney Wong, "Architects and Planners in the Middle of a Road War: The Urban Design Concept Team in Baltimore, 1966-71," *Journal of Planning History* 12.2 (2013), 179-202. See also this dissertation's preceding chapters.

[6] For more on interdisciplinary conflicts between engineers, designers, and planners, see Joseph F. DiMento and Cliff Ellis, *Changing Lanes: Visions and Histories of Urban Freeways (*Cambridge, Mass: MIT Press, 2013); Louis Ward Kemp, "Aesthetes and Engineers: The Occupational Ideology of Highway Design," *Technology and Culture* 27 (1986), 759-797.

[7] The address of the President of the American Association of State Highway Officials (AASHO) John Morton at the November 1967 Senate hearings regarding urban freeways offers a particularly clear expression of this frustration: here Morton characterized protesters as chronically dissatisfied and accused planners of professional ignorance and base opportunism. *Urban Highways: Hearings before the United States Senate Committee on Public Works*, 152-167.

planning.[8] Concurrent to the advisors' meetings, a series of activities at the national level demonstrated this shift in tactic. In 1966, three acts – the Federal-Aid Highway Act, the Department of Transportation Act, and the National Historic Preservation Act – codified protections for urban sites threatened by freeway development. All acts contained provisions protecting parks and historic sites from freeways, making it more feasible for local groups to use legal action to initiate governmental re-evaluation of such plans.[9] In November 1967, Congress would hold a series of hearings on urban highways, which would enable many designers and planners to enter into official record their criticisms of engineers' approaches to urban freeway planning to date.[10] In the midst of these governmental re-evaluations and adjustments, the Urban Advisors' project constituted another federal-level effort to signal support for locally sensitive freeway planning.

The advisors' board served several purposes at once. In bringing designers, planners, and engineers together, Whitton advocated for greater interdisciplinarity in freeway design. In asking them to develop a series of design guidelines for highway engineers to adopt in siting and design, he sought to provide engineers with new tools for easing local resistance to freeway

[8] During these years, the federal organization of highway oversight was being reordered. The Federal Highway Association was created on October 15, 1966, in an effort to strengthen federal capacity for highway coordination and oversight; in 1967 the functions of the Bureau of Public Roads were in the process of being transferred into the new organization. This was one of several reorganizations of federal road construction agencies that took place in the twentieth century, as the demand and scale of road building changed throughout the country. *Ideas & Actions; a History of the Highway Research Board, 1920-1970* (Washington, D.C: U.S. Highway Research Board, 1971); *America's Highways, 1776-1976: A History of the Federal-Aid Program* (Washington, D.C.: U.S. Dept. of Transportation, Federal Highway Administration, 1977).

[9] As historian Raymond Mohl puts it, these laws "gave freeway fighters the tools they needed to litigate, postpone, and delay highway construction." Raymond A. Mohl, "The Interstates and the Cities: The U.S. Department of Transportation and the Freeway Revolt, 1966–1973," *Journal of Policy History* 20.2 (2008), 193–226.

[10] *Urban Highways: Hearings before the United States Senate Committee on Public Works*.

construction.[11] In demonstrating an effort to imagine and build better freeways, Whitton made a political last-ditch attempt to approach these controversial infrastructures in such a way that they stood a chance of getting built at all. With all these aspects at play, the board functioned simultaneously as an interdisciplinary olive branch to designers and planners, a prompt to state engineers and officials to try new approaches, and an effort to shift the tone and terms of a national discussion that was mired in controversy.

Simonds' brief meeting note would prove to be a remarkably full summary of issues and themes that the advisors would engage in the process to come. His characterization of the freeway as a line of "force" represented the group's shared understanding that infrastructure dynamically and interactively impacted a larger environment of which it was a part. In seeking to "resolve" that force, Simonds gestured at the advisors' interests in moderating the freeway's destructive potential. In emphasizing that such work should be done "skillfully," Simonds highlighted the value of disciplinary expertise in locating, planning, and designing freeway structures.

This note was also telling in that this freeway had no site. His phrase "a line of force" emphasizes energetic and dynamic qualities, in synergy with discussions of freeways and natural forces found in this dissertation's previous chapters. And yet unlike in those earlier projects, here the environment surrounding that line was merely implied, a passive recipient; it has no direct presence or power. Rather than conceiving of the freeway as imbricated within a location, here

[11] At a meeting with the Urban Advisors on March 10, 1966, Whitton asked them to create "guidelines and axioms to give to highway engineers throughout the country… requests the states will take." Simonds meeting notes, March 10, 1966, Box 149, Agendas, Minutes, John Ormsbee Simonds Collection, Special & Area Studies Collections, University of Florida George A. Smathers Libraries.

Simonds presented its infrastructural power in the abstract: as lone concept, a potentially impactful energy floating in isolation.

Simonds' characterization of the freeway thus reflected the massive scale and abstract circumstances of the advisors' work, and presaged the related challenges that they would soon encounter. The adjusted federal freeway stance to which the advisors had been asked to contribute constituted an official recognition of local power and the values of design and planning expertise. It also manifested an effort to strengthen legislative and professional frameworks as mechanisms of control over local controversies: determining how those controversies would be defined, envisioned, debated, and decided. In seeking to redefine local freeway conflicts as matters of federal policy, officials within the federal government began redefining local protests – and local environments – on more universal, abstracted terms.[12]

The advisors had a uniquely difficult project before them. They were tasked with providing government engineers and officials with tools for making more locally sensitive freeways, not by analyzing and revising any specific city plan, but rather by generating principles abstracted and universalized enough to apply to any and all urban circumstances.[13] This, however, ran directly counter to the arguments that designers and protestors alike had been leveling against freeway construction to this point, which were premised on an idea that every threatened city, neighborhood, and park was uniquely valuable in its mix of cultural, environmental, social, economic, material, and structural elements. This abstraction also ran counter to the very

[12] As AASHO president John O. Morton put it at the 1967 congressional hearing: "our major problem is that we have not developed a governmental mechanism, or the planning and the financing to keep a city a healthy, living organism." *Urban Highways: Hearings before the United States Senate Committee on Public Works*, 158.

[13] This was in keeping with the traditional approach at the federal level, where urban freeways largely existed as abstractions: diagrammatic lines circumscribing or intersecting nebulous city shapes, viewed from above or unmoored from context (see, for example, Chapter One, Figures 1.6, 1.7).

expertise that designers and planners brought to the table, which was fundamentally centered on identifying, envisioning, and designing sites.

Relative to these conundrums, this chapter tracks several questions. What was it to aggregate numerous unique freeway environments into a single abstracted characterization, and what happened to the notion of the urban environment when it was defined in this way – what qualities were lost, and what qualities were gained? Furthermore, how could the expertise of designing for unique localized conditions be effectively represented outside the context in which that expertise was typically made to matter? In other words, what was it for these designers and planners to represent their expertise in the absence of the localized, land-based condition against which they typically defined and evaluated their work, its challenges, and its successes? How could they demonstrate the value – even the very existence – of their environmental design expertise on abstract legislative and procedural terms?[14]

In a collective effort to redeem, preserve, and advance their professional authority in the face of rapid political and governmental change, the urban advisors would, in fact, repeatedly downplay the situated specificity of individual cities and lived experience in favor of an unmoored, "one size fits all" approach to freeway design.[15] Within the resulting abstracted discourse they would make distinct efforts to carve out a place for design thinking, largely by promoting the qualitative dimensions of design skill relative to government engineers'

[14] The advisors would, in fact, refer to themselves as environmental designers in their final book as experts in "urban design and environmental planning." Michael Rapuano and U.S. Advisors to the Highway Administrator, *The Freeway in the City* (US Govt. Print. Office, 1968), 15.

[15] Because landscape architects and planners had led parkway design and transportation planning prior to World War II, they saw highway design as an area of great professional value and historic identity for their fields. They also tended to perceive exclusion in postwar freeway planning and design as a loss of disciplinary authority. In this sense, the planners and designers on the Board of Urban Advisors likely saw it as their responsibility, not to gain new projects in freeway design, so much as to reclaim lost professional territory. Regarding their perspective, see, for example, "Landscape Design in Highway Development," *Landscape Architecture Magazine* (1941), 71-73.

quantitative approaches. And yet without the site-based specificities that defined both local protests and their own expertise, these designers' and planners' calls for respecting design "creativity" and "intuition" would prove meager at best. This chapter examines the compromises that the advisors faced and the ambivalence that they felt throughout this effort, especially with regards to the challenge of representing a profession whose very approaches were devised for engaging localized particularity within a context utterly devoid of such specificity.

Meetings: Establishing an Advisory Role for Designers at a National Scale

The board of Urban Advisors was the result of a joint initiative between the American Association of State Highway Officials (AASHO) and the FHWA. This was not the first time that either of these organizations had asked architects, landscape architects, and urban planners to weigh in regarding freeway design. A series of national conferences on the subject had been previously been sponsored beginning in the late 1950s, some convened by AASHO with local and county organizations, others by the Highway Research Board. The outcomes of these conferences were varied. Bringing engineers, designers, planners, and highway officials together into one discussion likely had a value in its own right at this time, given existing interdisciplinary tensions regarding freeway design. Beyond that, the events established some general principles regarding freeway design and planning, seemed to inspire some designers to get more involved in freeway-related work, and may well have inspired some engineers to be more open to design and planning perspectives. They did not, however, effect any significant reconfiguration of the

roles of designers, planners, and engineers in freeway design work, nor did they seem to change general attitudes within the various professions regarding the character of freeway design.[16]

According to John O. Morton, AASHO president, in July 1965 the twenty Chief Engineering Officers of state highway departments who comprised AASHO's Planning and Design Policies Committee proposed to convene a multi-disciplinary group of engineers, planners and designers to develop some general guidelines for the design of urban freeways for state highway departments to use in their work. Whitton offered to fund the formation of such a committee, and to serve as their liaison.[17] Whitton selected the members of the board of urban advisors over the course of several months in 1965. A mix of landscape architects, planners, architects, and civil and structural engineers, they represented cities from all regions of the United States. All had reputations for leadership in their fields; most had previously represented their professions at the national level in some way, and most had been involved in freeway debates in their own cities. Several had participated in one of the national conferences regarding urban freeway design, or in the 1965 Conference on Natural Beauty.[18]

Among the advisors, John O. Simonds eventually took on the most central role: assuming the compilation and editing of the group's production of their *Freeway in the City* book in the project's final months, he would function as the group's project manager, facilitator, print editor, and idea visualizer. Simonds had studied at the Harvard Graduate School of Design in 1936-39,

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[16] See *The Sagamore Conference on Highways and Urban Development*; *Freeways in the Urban Setting: The Hershey Conference*; *Highways and Urban Development: Report on the Second National Conference, Williamsburg, Va*.

[17] *Urban Highways: Hearings before the United States Senate Committee on Public Works*, 161-162.

[18] Rockwell participated in the 1962 Hershey conference, as did Donald Appleyard. Halprin, Simonds, and Rockwell all participated in the Conference on National Beauty, at which there was extensive discussion regarding highway landscapes. Ian McHarg, Garrett Eckbo, Christopher Tunnard, and Boris Pushkarev also participated in that conference. *Freeways in the Urban Setting: The Hershey Conference*; *Beauty for America: Proceedings of the White House Conference on Natural Beauty* (Washington DC: General Printing Office, 1965).

and then established the Pittsburgh, PA based landscape architectural firm Simonds and Simonds with his brother.[19] He taught landscape architecture at Carnegie Mellon University in the 1950s-60s, authored a much-used 1961 textbook on landscape architectural design, and was president of ASLA from 1963-65; it was in this last capacity that he met Whitton.[20]

Rapuano, Halprin, and Kavanagh would also play significant roles in the board's work: producing more written material, attending more meetings, and generally investing more time and energy in guiding and shaping the project's outcome than other members. Rapuano, who was chair of the advisory board, was based in New York City. In partnership with Gilmore Clarke, he had worked closely with Robert Moses on parkways and freeways throughout the New York area.[21] Lawrence Halprin was based in San Francisco. As detailed in Chapter One, he had worked for the State of California in a well-publicized attempt to redesign the San Francisco Panhandle Freeway in 1962-64, and his book *Freeways* was about to be published.[22] Thomas Kavanagh was a civil and structural engineer based in New York City. He had taught engineering at New York University, Pennsylvania State University, and Columbia, and was a partner in the engineering and architecture firm Praeger-Kavanagh-Waterbury. By the 1960s,

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[19] Simonds and Simonds had played some advisory roles in various local freeway debates. Regarding Simonds' time at the GSD, see Anthony Alofsin, *The Struggle for Modernism: Architecture, Landscape Architecture, and City Planning at Harvard* (WW Norton & Company, 2002), 168-169. For more on Simonds' work in Pittsburgh, see Susan Rademacher, *Mellon Square: Discovering a Modern Masterpiece* (Chronicle Books, 2014), 15-31, 141-144.

[20] In addition to participating in the 1965 White House Conference on Natural Beauty, Simonds was also a member of the Department of Commerce's Council on Highway Beautification. John Ormsbee Simonds Collection, University of Florida Smathers Libraries - Special and Area Studies Collections.

[21] Rapuano had worked at the Westchester County Park Commission under Gilmore Clarke, whose planning and design of Westchester County parkways in the 1920s had set the bar for all parkway designs that followed (See Chapter One for more on Clarke). In 1939 the two formed the New York based partnership Clarke & Rapuano. Many of Clarke & Rapuano's designs under Moses would become icons, in varying ways: the Brooklyn Heights Promenade would become a symbol of good freeway design, the Major Deegan Expressway in the Bronx, of bad freeway design. Regarding Clarke and Rapuano's work for Moses, see, for example, Matthew Gandy, *Concrete and Clay: Reworking Nature in New York City* (Cambridge, Mass.: MIT Press, 2002); 118-137.

[22] For more on Halprin, see Chapter Two.

Kavanagh was a strong proponent of systems engineering; he would be a significant influence on the advisors' advocacy of a systems approach to freeway design.

Springer, Rockwell, Roche, and Powell would play relatively minor roles throughout the process: contributing some text, weighing in on major decisions, and attending most meetings, but refraining from taking active guiding roles. A MIT-trained urban planner and architect based in Chicago, Matthew Rockwell was executive director of the Northeastern Illinois Planning Commission, where he had been involved in various Chicago-area planning debates and discussions regarding freeways.[23] Springer was located in Dallas: he had served as City Planning Director in the 1950s prior to starting the planning firm Marvin Springer Associates, where he worked on a 1964 evaluation of the city's proposed outer loop highway.[24] Harry Powell was a Seattle-based structural engineer known for his bridge design; his major contribution would be to the final report's discussion of the design of elevated structures. Lastly, Kevin Roche was a Hamden, Connecticut-based architect and partner in Kevin Roche John Dinkeloo and Associates, which he formed after studying under Mies Van der Rohe at Illinois Institute of Technology and working on Eero Saarinen's most renowned projects through the 1950s-60s.[25]

At their first meeting on January 26, 1966, the board met in Washington, D.C. and engaged in broad-ranging debate regarding the role of design in freeway projects, and the potential of

[23] Rockwell had attended the 1962 Hershey Conference in his capacity as Director of Public Affairs and Urban Programs for the American Institute of Architects in Washington, D.C. *Freeways in the Urban Setting: The Hershey Conference*.
[24] Springer graduated from the university of Iowa in 1940, and then worked for the city planners Harland Bartholomew & Associates. In 1950 he became the City Planning Director of Dallas, and in 1959 he started Marvin Springer Associates. In 1964, the firm conducted an evaluation of plans for Dallas' Outer Loop Highway. Marvin D. Springer Obituary, *Peoria Journal Star*, Apr. 23, 2012.
[25] In 1966, after working to complete several Saarinen projects after his death, Roche joined John Dinkeloo to form Kevin Roche John Dinkeloo and Associates. Together, their first major commission was the Oakland Museum of California. Nicolai Ouroussoff, "Turning a Rearview Mirror on Kevin Roche," *The New York Times*, February 22, 2011.

systems-based, team-oriented problem solving to support the creation of better freeway proposals.[26] They also debated the board's role relative to the local freeway debates occurring around the country. Many of the advisors had been contacted by New Orleans freeway protestors prior to the meeting, who asked the advisors to mediate in the city's ongoing freeway conflict by serving as a review board for the state's proposals. After some deliberation, the group recommended to Whitton that a national freeway design review board be established. They also agreed that they should not serve such a function, and decided to avoid weighing in on specific controversies themselves. They would, instead, remain focused on Whitton's request for a series of freeway design recommendations geared towards engineers and officials, and also available for broader public use.[27]

The advisors continued to receive entreaties for local involvement over the next couple months. In February, Simonds received a letter from two members of the San Antonio Conservation Society, who had participated in a six year long battle against a freeway proposed to be routed through the city's only large park.[28] In March, he received a letter from the Chairman of the Committee to Preserve Philadelphia's Historic Gateway, who was concerned about the proposed Delaware Expressway's potential impact on a historic Philadelphia

[26] The group also briefly summarized prior national conferences on freeway design, and noted and reviewing relevant design precedents: reviewing the events and outcomes of the Hershey, Williamsburg, and Sagamore conferences, and discussing various highway design precedents.
[27] In light of having received several requests for support from freeway protestors in New Orleans and Philadelphia, the group debated whether they should act as a review board for specific controversial freeway designs, ultimately deciding that this was beyond the scope of their work. "Notes of the January 26 Meeting," Box 149, Agendas, Minutes, John Ormsbee Simonds Collection, Special & Area Studies Collections, University of Florida George A. Smathers Libraries.
[28] The park referred to here was Brackenridge Park. Mohl, "The Interstates and the Cities," *198.*

neighborhood.[29] In both cases, the letter writers asked that the board of advisors intervene at the federal level on their behalf.

The majority of letters were from New Orleans, where a heated battle was underway regarding a proposed freeway that would divide the historic French Quarter from the Mississippi River. The New Orleans freeway revolt had started around the time of the San Francisco revolt. In 1966, protesters developed a collective argument that holistically characterized the city as a social and environmental milieu; as such it was similar to the approach that San Francisco freeway protestors had developed a couple years earlier.[30] Just two days before the advisors' first meeting, Whitton had announced the BPR's approval of an elevated freeway between the Vieux Carre and the Mississippi River; New Orleans freeway protestors remained undeterred by his ruling.[31] In February, Simonds received letters from landscape architect Christopher Friedrichs, the Independent Women's' Organization of New Orleans, lawyers of the firm Baumbach and Borah, and the city's Archbishop. The writers asked the board of advisors to either advocate for a

[29] Stanhope S. Browne to John O. Simonds, March 8, 1966, Box 148, Correspondence, 1965-67, John Ormsbee Simonds Collection, Special & Area Studies Collections, University of Florida George A. Smathers Libraries. For more on Philadelphia's freeway controversies, see John F. Bauman, "The Expressway 'Motorists Loved to Hate': Philadelphia and the First Era of Postwar Highway Planning, 1943-1956," *The Pennsylvania Magazine of History and Biography* 115.4 (1991), 503–533; Sebastian Haumann, "Vernacular Architecture as Self-Determination: Venturi, Scott Brown and the Controversy over Philadelphia's Crosstown Expressway, 1967-1973," *Agency in Architecture: Reframing Criticality in Theory and Practice* 3.1 (2009), 35-48.

[30] Regarding San Francisco, see Chapter Two. Here, concern for the city's environment was manifested in a defense of the city's historic riverfront, while concern for the social involved preservationist defenses of the city' historic French Quarter, which would be severed from the river by the freeway. Ari Kelman, *A River and its City: The Nature of Landscape in New Orleans* (Univ of California Press, 2003), 197-222.

[31] After extensive debate in 1966 and 1967, the freeway would finally be cancelled at the federal level in 1969. Kelman, *A River and its City*; see also Richard O. Baumbach, and William E. Borah, *The Second Battle of New Orleans: A History of the Vieux Carre Riverfront Expressway Controversy* (University of Alabama Press, 1981).

comprehensive study of alternative routes, hasten a federal review of the freeway proposal, or act on behalf of local protesters in whatever way possible.[32]

Whitton and Simonds both wrote letters of response to the protestors. Whitton's letter to Mrs. John Ormond of the Independent Women's' Organization of New Orleans was formal: he noted that the advisory board was not a review board, reminded Ormond that the established procedure for freeway route planning and evaluation was in process, and directed her to her state highway division. Simonds reiterated Whitton's comment that the advisory board was not a review board and therefore could not act in the New Orleans case. He closed, however, with a more supportive, personal note: "As a private citizen however I fervently share your desire, and that of hundreds of thousands of people across the country, that the integrity of the New Orleans French Quarter be in no way threatened by expressway development."[33] It is possible that Simonds was personally opposed to the New Orleans freeway; at the very least, he clearly felt sympathy for the protestors. Regardless of this personal inclination, he and the rest of the advisors decisively removed the board from involvement in local debates. Instead, they committed themselves to delocalized, national scale action: dedicating themselves to generating design principles that could be applied in any urban context.

The board adopted a universalized approach in other ways as well, particularly with regards to systems thinking. At their first meeting, Kavanagh suggested that they advocate for a "systems approach" to freeway design. Describing systems thinking as a rational method through which interdisciplinary teams of experts could collaboratively model and solve complex dynamic

[32] Box 148, Correspondence, 1965-67, John Ormsbee Simonds Collection, Special & Area Studies Collections, University of Florida George A. Smathers Libraries.
[33] John O. Simonds to Mrs. John Ormond, February 2, 1966, Box 148, Correspondence, 1965-67, John Ormsbee Simonds Collection, Special & Area Studies Collections, University of Florida George A. Smathers Libraries.

problems, he noted that it "was widely in fashion," adding that "all branches of government were using it today and the proposal would therefore be readily, in fact probably enthusiastically, accepted."[34] The initial response among the board's designers and planners was to call out contradictions between the mechanistic precision of systems thinking and the qualitative dimensions of design expertise. Several of them expressed concern that the rationality of the systems approach failed to acknowledge the importance of design expertise, because systems models did not account for "creative" problem solving and "design intuition." In the advisors' first meeting, Roche commented, "the group can be most effective by adding in the 'human factor' which cannot in any event be added into problem solving by a computer, i.e. the creative factor." Similarly, Halprin argued: "there exists a deep dichotomy between the engineering approach with its use of clear, pre-ordained goals and systems to achieve it and the creative design approach where even the goals are not clear but evolve in the process of design where intuition plays such a significant role."[35]

After voicing these concerns, however, the group nonetheless quickly embraced the systems approach that Kavanagh had proposed.[36] Halprin took a particular interest in the systems idea, noting that it was resonant with a 1962 highway location project by Christopher Alexander

[34] "Notes of the January 26 Meeting," 4.
[35] Springer expressed a similar concern regarding aesthetics, arguing, "these intuitive decisions cannot be thought of as simply cosmetic which is a tendency for engineers to think. They must be much more basically applied and start from the beginning with route selection… esthetics are often thought of as something you apply later but in fact it starts with basic decisions." Op.cit., 1, 5-6.
[36] Kavanagh discussed various interpretations and ideas regarding the approach with group members, and shared articles regarding applications of systems thinking in freeway design: including the highway location work of Roberts and Suhrbier (see Chapter Four), examples of novel systems-related applications of computer graphics, and discussions in architectural journals regarding the potentials of systems thinking in urban design. Paul O. Roberts and John H Suhrbier. "Highway Location Analysis: An Example Problem," *M.I.T. Report No. 5* (MIT Press, 1966); *Progressive Architecture*, August 1967.

and Marvin Manheim that he admired.[37] Shortly after the first gathering, Halprin circulated his meeting notes, including a detailed description of the systems approach that Kavanagh had presented. After this Kavanagh wrote a letter to the group elaborating on Halprin's summary, noting:

> The systems concept is fundamentally a decision-making process which considers alternative approaches to overall design (or to a problem) in order to arrive at a system that provides optimum performance with respect to some established criteria. The "system" itself may be an integrated (usually large and complex) assembly of interacting elements, components or sub-systems, designed to carry out collectively a pre-determined function. The systems approach is best suited to dynamic problems, those where conditions of load, environment or information inputs vary with time.[38]

According to Kavanagh, then, engaging a systems approach would address several of the issues that the advisory board sought to tackle. Its popularity in government circles meant that it would be well received by the book's intended audience; it offered a model for interdisciplinary team collaboration; and it provided a framework for solving dynamic problems that were both technical and environmental in character.[39]

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[37] The urban advisors' discussions regarding systems thinking appear to have significantly influenced Halprin, particularly with regards to his formulation of design process. The various design phases described in Halprin's 1970 book *The RSVP Cycles*, in fact, while described with different terminology than Kavanagh's, are nonetheless markedly similar to the problem-solving model that Kavanagh outlined in meetings and in FITC's final text. Lawrence Halprin, *The RSVP Cycles: Creative Processes in the Human Environment* (New York: G. Braziller, 1970).

[38] Kavanagh to Halprin (circulated to all advisors), February 10, 1966, Box 148, Correspondence, 1965-67, John Ormsbee Simonds Collection, Special & Area Studies Collections, University of Florida George A. Smathers Libraries.

[39] Kavanagh's description of the "systems approach" combined two different strains of systems application: one was related to the PERT, or Program Evaluation and Review Technique, management approach: a workflow management process that used circuit-like path diagrams to outline project tasks that was particularly popular in government project management at the time. The other was a more cybernetics-oriented notion of using specific problem-solving processes to address complex interactive scenarios: as demonstrated in the highway location approach discussed in Chapter Four, and also in the models of environments promoted by postwar systems ecologists such as Eugene and Howard T. Odum. For a history of PERT, see Peter W.G. Morris, *The Management of Projects* (Thomas Telford, 1997), 19-88. For more on systems ecologists' applications of cybernetics to modeling living systems and the impacts on landscape architectural design, see Margot Lystra, "McHarg's Entropy, Halprin's Chance: Representations of Cybernetic Change in 1960s Landscape Architecture," *Studies in the History of*

One can see, under these circumstances, why the advisors would see the strategic value in exploring a systems approach to freeway design. And yet it is surprising how quickly they embraced a systems approach, given that several of them doubted its compatibility with their own expertise. One possible reason is that their very roles in this project presented a conundrum. In order to convince highway engineers and officials to include designers and planners in the freeway design process, they needed to demonstrate the value of their profession's knowledge and expertise – including intuition and creative process – to an audience whose own expertise was defined on exclusively quantitative knowledge and skill. Rapuano noted the delicacy of this task, albeit with some hyperbole, when writing to Simonds that their text "should be as factual as possible, as plausible as possible because realism is the engineers' Bible and anything that smacks of too much long-hair might defeat the very process we hope to set forth for the design profession in the future."[40]

The group's debates on this topic and their quick acceptance of a systems model reveal the challenges they faced in attempting to find a shared conceptual basis for interdisciplinary collaboration. These discussions also demonstrate the degree to which the advisors had difficulty articulating the value and importance of design expertise in the abstract. In discussion they repeated a narrow set of terms to describe their professional skills – "intuition," "creative process," "aesthetics" – without elaborating on the practices, qualities, techniques, or methods that these terms designated.[41] Such words were problematically vague descriptors for the

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Gardens & Designed Landscapes 34.1 (2014), 71-84; Peter J. Taylor, "Technocratic Optimism, H. T. Odum, and the Partial Transformation of Ecological Metaphor After World War II," *Journal of the History of Biology* 21.2 (1988), 213-244.

[40] Rapuano to Simonds, October 13, 1967, Box 148, Correspondence, 1965-67, John Ormsbee Simonds Collection, Special & Area Studies Collections, University of Florida George A. Smathers Libraries.

[41] See this dissertation's Introduction for a broader discussion of the role of tacit knowledge in design practices.

complex techniques and methods that comprised design-based problem solving; in comparison, systems thinking certainly offered a far more coherent, detailed, and defensible framework for freeway design.

As the advisors had initially observed, the systems approach would not be without its compromises. As a conceptual umbrella for bringing together multiple professional perspectives on freeway design, the approach did temper technical approaches to problem solving with a greater role for creative design thinking.[42] However, this positioned design thinking in a tempering role: among a group predominantly composed of designers and planners, gathered to promote design and planning principles, engineering remained central. Furthermore, the systems approach exacerbated the problematic tendency towards abstraction that was part and parcel of the national, governmental context. By strategically framing their roles and arguments in ways that could impact freeway design at the federal level, the designers also undermined their own "creative," "intuitive," site-based expertise.

A Struggle with Localism: The First Iteration of the Advisors' Report

Following their initial meetings and correspondence the advisors continued to meet every few months, mostly independently of FHWA officials. In the first year of meetings they reviewed existing literature on highway and freeway design, discussed the book's broad goals,

[42] Indeed, in comparison to the systems approach, the advisory board's designers and planners tended to find far fewer points of connection with the group's engineers when discussing the specifics of construction and design. For example, in an early draft of a section of the book on structures, Simonds took issue with a great many of Kavanagh's assertions regarding the aesthetic qualities of bridges and other freeway structures. "Draft - November 1, 1967, Part II - New Horizons," Working Papers 1966-1968, Freeway in the City (Bureau of Public Roads – Report), John Ormsbee Simonds Collection, University of Florida Smathers Libraries - Special and Area Studies Collections.

format, and content, and shared preliminary writings on broad themes.[43] They met in various cities, so that they could tour several freeway systems. Different board members coordinated these meetings, according to where they lived: Rapuano hosted meetings and tours in New York City, Rockwell in Chicago, Springer in Dallas.[44] At these meetings, the advisors would stay at a hotel in or near downtown and participate in two tightly timed days of meetings, meals, and drinks, punctuated by an afternoon bus tour of the city's freeways.[45] In these quick, fully scheduled visits, the advisors essentially observed local scenes through the vantage points of businessmen traveling for work.

Within the first few months of their process, the advisors hired an editor and began working with him on producing the intended report. In a March 1966 meeting, they reinforced the principle-oriented objectivity that they had begun to define in their first gathering: agreeing that the editor was "not to be a specialist but rather to be a journalist and impartial."[46] Here they listed four possible hires: Don Canty and Jim Bailey, both recent editors at *Architectural Forum*,

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[43] In addition to reviewing previous conference proceedings and various Highway Research Board and AASHO publications, the advisors also discussed, for example, the work of Alexander and Manheim (see Chapter Five), *The View from the Road* (see Chapter Three), writings on freeway aesthetics by Boris Pushkarev, a highway location project by students at MIT entitled "Project Metran," and an issue of *Progressive Architecture* that focused on systems thinking and discussed freeway design projects. Christopher Tunnard and Boris Pushkarev, *Man-Made America: Chaos or Control? An Inquiry into Selected Problems of Design in the Urbanized Landscape* (New Haven: Yale University Press, 1963); Boris Pushkarev, "Esthetic Criteria in Freeway Design," *Highway Research Board Proceedings* 41 (1962), 89-108; Mark E. Hanson, *Project Metran: An Integrated, Evolutionary Transportation System for Urban Areas* (Cambridge, Mass.: M.I.T. Press, 1966); *Progressive Architecture*, August 1967.

[44] A meeting in San Francisco was also planned, but was moved to Washington D.C. for logistical reasons. Box 149, Agendas, Minutes, John Ormsbee Simonds Collection, Special & Area Studies Collections, University of Florida George A. Smathers Libraries.

[45] Box 149, Agendas, Minutes, John Ormsbee Simonds Collection, Special & Area Studies Collections, University of Florida George A. Smathers Libraries.

[46] Four names were listed in these notes: Don Canty and Jim Bailey, both recent editors at *Architectural Forum*, and Walter McQuade and William H. Whyte, Jr., both recent editors at *Fortune* Highway Advisory Group meeting minutes, March 10, 1966, Working Papers, 1966-1968, John Ormsbee Simonds Collection, University of Florida Smathers Libraries - Special and Area Studies Collections.

and Walter McQuade and William H. Whyte, Jr., both previous editors at *Fortune*. Roughly a month later, they hired McQuade for the position.[47]

If the advisors' initial idea was to hire someone "impartial," McQuade's affiliations arguably predisposed him otherwise, towards a pro-community-empowerment, anti-freeway stance. Trained as an architect, he was a well-respected New York-based writer and prolific architectural critic. Beginning in the 1940s, he held positions at *Architectural Forum*, *Fortune*, and *The Nation*, where his former co-workers Jane Jacobs and William H. Whyte were both active in neighborhood-based resistance to New York City freeways throughout the 1960s.[48] In other design contexts, McQuade's community-oriented stance would not likely be a source of potential conflict. Indeed, several of the advisors shared his political and cultural leanings, and some were friends.[49] In this instance, however, McQuade's approach to the freeway project would increasingly become a complicating factor.

In a letter to Rapuano in June 1966, McQuade expressed a clear interest in crafting the advisors' publication as a popular, on-the-ground approach to freeways. He envisioned three products: a technical publication listing a series of principles regarding freeway design; a general-interest book geared towards the public that incorporated the principles with a series of experiential photo-essays; and a traveling exhibit of freeway photographs that would be

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[47] Agenda, Dallas Meeting, May 20, 1966, Box 149, Agendas, Minutes, John Ormsbee Simonds Collection, Special & Area Studies Collections, University of Florida George A. Smathers Libraries.
[48] McQuade was a writer at *Architectural Forum* beginning in 1947, working for a decade with Jane Jacobs, who was associate editor from 1952-62. In 1964 he moved to *Fortune*, where William H. Whyte had been senior editor from 1946-58. He served as architecture and design critic for *The Nation* from 1959-1965, and for *Life* Magazine from 1970-1974. "Walter McQuade, 72, Architecture Critic," *The New York Times*, December 29, 1994; Walter McQuade Papers, Rare and Manuscript Collections, Cornell University.
[49] McQuade and Halprin had been friendly associates since at least 1960, when McQuade asked Halprin to draw an illustrative essay for *Architectural Forum* regarding how to care for street trees. According to their correspondence, it seems that Halprin delivered material too racy to print. Professional Part I, Box 2, Walter McQuade Papers, Rare and Manuscript Collections, Cornell University.

organized around the principles. The advisors would generate the material for the technical publication, while McQuade would work with photographers and a writer to generate the material for the general-interest book and exhibit.[50]

For the products under his care McQuade hired two young photographers, Elaine Mayes and Paul Ryan, to spend the summer travelling and documenting California's historic Camino Real, both its remote rural portions and its modern urban ones. He hired a third young photographer, David Plowden, to photograph east coast roads. For the writing, he hired Harry Middleton, a journalist and editor for *Architectural Forum* who would soon take a position as a Staff Assistant and speechwriter for President Lyndon B. Johnson.[51] Mayes and Ryan's photo-essay of El Camino Real was to form the central component of the general-interest book and exhibit, complemented by some of Plowden's smaller photo-studies, and Middleton's slice-of-life interviews of the advisors themselves.

In late 1966 and early 1967, Middleton delivered drafts of the book's first chapter to the advisors for review.[52] Both times, the group expressed reservations about the text's content and style. Their primary concern was that the text was far too critical of highway engineers,

[50] Walter McQuade to Michael Rapuano, June 13, 1966; Walter McQuade to Michael Rapuano, November 16, 1966, Box 148, Correspondence, 1965-67, John Ormsbee Simonds Collection, Special & Area Studies Collections, University of Florida George A. Smathers Libraries.
[51] Middleton took the freeway assignment in 1966, and was hired by Johnson in January 1967; but he would continue working on it during the following several months, between his other assignments. Walter McQuade to Michael Rapuano, November 16, 1966, Box 148, Correspondence, 1965-67, John Ormsbee Simonds Collection, Special & Area Studies Collections, University of Florida George A. Smathers Libraries.
[52] These drafts are not in the archives, so their material is unknown. Memorandum from Michael Rapuano to the Urban Advisors, February 14, 1967, 2/14/67, Box 148, Correspondence, 1965-67, John Ormsbee Simonds Collection, Special & Area Studies Collections, University of Florida George A. Smathers Libraries.

government officials, and freeway projects to date.[53] As Springer put it: "I see nothing constructive to be gained from pointing fingers at highway engineers or any other group. We need strong positive statements and guidelines which illustrate what highways can and should be in cities."[54] A secondary concern was that the text was too popular in tone, and therefore off the mark with regards to the advisors' primary task of creating design guidelines.[55] At a somewhat awkward meeting with McQuade in March 1967, the advisors and BPR representatives discussed these issues. They agreed that the project had strayed too far from original intentions, and that attention should return to Whitton's original request for a primarily technical report proposing best practices for freeway design.

A couple months later McQuade resigned, despite several advisors' requests that he continue. Although his resignation was ostensibly for health reasons, surrounding correspondence made it clear that the primary reason involved conflict regarding his approach. McQuade and Middleton's early work had apparently offended federal officials and engineers with its heavy critique of prior freeway projects and the government's role in them.[56] Yet even

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[53] After the first draft was delivered, Rapuano's memo to the advisors noted, "I hope you all have all had an opportunity to meet and discuss the major problems with Mr. Middleton…" Memorandum from Michael Rapuano to the Urban Advisors, November 17, 1966, Box 148, Correspondence, 1965-67, John Ormsbee Simonds Collection, Special & Area Studies Collections, University of Florida George A. Smathers Libraries.

[54] Memorandum from Marvin Springer to the Urban Advisors, March 15, 1967, Box 148, Correspondence, 1965-67, John Ormsbee Simonds Collection, Special & Area Studies Collections, University of Florida George A. Smathers Libraries.

[55] Halprin wrote, for example, that the material "reads much like a magazine article for laymen – a critique of present conditions – a breezy popular version with emphasis on personalities." Lawrence Halprin to the Board of Urban Consultants, March 13, 1967, Box 148, Correspondence, 1965-67, John Ormsbee Simonds Collection, Special & Area Studies Collections, University of Florida George A. Smathers Libraries.

[56] McQuade had cataracts, and had undergone surgery for one eye in 1966 – so it is certainly possible that his health played some role here. However, in correspondence from this time, several advisors' encouragement to McQuade to stay working makes it clear that his health concerns were not so great as to make it necessary for him to stop work. Later correspondence between Simonds and Rapuano, meanwhile, mentions that highway officials were offended by McQuade's work as the primary reason for his work

with a more conciliatory tone, it is likely that McQuade's approach was poorly matched to this project. His proposal did draw on robust precedent for federally funded, photographic, place-rooted journalism, as evidenced by the very journals with which McQuade had worked in recent decades: both *Fortune* and *Architectural Forum* had pioneered community-empowerment oriented photography projects in the New Deal era.[57] McQuade's approach to this project was reminiscent of that era; even his choice of the El Camino Real evoked that history, as it occupied the same terrain as Dust Bowl era relocation camps that had been documented by Farm Security Administration photographers. In this sense, McQuade harkened back to a unique period when the federal government was directly involved in documenting and supporting grassroots community-building activities. He described his interest in such an approach in almost folksy terms, writing to Rapuano, "what I hope we will come out of this with is a unique documentation of the effect of roads on people and people on roads."[58]

Such reference to the New Deal era was not entirely out of place – this was, after all, another period of rapid increase in federal oversight and funding. However, the localism and place-building approaches of the New Deal era were not of interest to highway engineers, who saw their work as fundamentally technical, and felt thwarted by local opposition. AASHO president Morton would express disdain for local concerns at the November 1967 urban highways congressional hearing, arguing, "if we attempt to satisfy 90 percent of the people… our

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not being continued. McQuade papers, Health Problems, Box 1, Walter McQuade Papers, Rare and Manuscript Collections, Cornell University; Various, Box 148, Correspondence, 1965-67, John Ormsbee Simonds Collection, Special & Area Studies Collections, University of Florida George A. Smathers Libraries.

[57] *Fortune* and *Architectural Forum* were sister publications, both part of Henry Luce's Time-Life corporation.

[58] Walter McQuade to Michael Rapuano, June 13, 1966, Box 148, Correspondence, 1965-67, John Ormsbee Simonds Collection, Special & Area Studies Collections, University of Florida George A. Smathers Libraries.

job is relatively simple… at 98 percent, you run into controversy and you draw criticism from the so-called artistic and creative people."[59] It was in this context that the advisors, seeking to convince engineers that design and planning based approaches were feasible and desirable, remained cautious about causing offense.

Towards the Final Product: Systems and Diagrams

After McQuade's resignation, plans for the general-interest book and exhibit were discarded. The advisors dedicated their attention to producing the technical publication, and Simonds agreed to take over as book editor.[60] The advisors had already divided responsibility for producing content for the technical publication: each member was to create a list of 25 principles of urban freeway design, as well as an additional list of principles regarding each person's area of expertise. The group had also determined who would write on the book's topics: Rapuano would compose "Alignment and Location," Kavanagh and Powell would address "Structures," Halprin would write on "Value Judgments," Springer and Rockwell would write "Planning," and Simonds would contribute to all sections and track the book's overall development.

In late spring 1967, Simonds combined and edited all materials written to that point. Two months later he circulated a first draft of combined principles, broken into thematic sections.[61]

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[59] *Urban Highways: Hearings before the United States Senate Committee on Public Works*, 158.
[60] "Meeting of the Board of Urban Consultants to the Bureau of Public Roads - June 27, 1967," Box 149, Agendas, Minutes, John Ormsbee Simonds Collection, Special & Area Studies Collections, University of Florida George A. Smathers Libraries.
[61] Simonds circulated an outline of the book plan and a first draft of principles on August 2, 1967. Here, the principles were broken into ten sections: The Design Approach (process), Comprehensive Planning (goals, structuring, etc.), Location (alignment, geometry, etc.), Community Values (social, economic, political, historical, cultural), Visual Aspects, Impact on the Urban Landscape, The Roadway (width, section, treatment, characteristic), Use of the Corridor (a new concept of), Highway Structures (and hardware), and Administration-Legislation. "Memo to: Advisory Board of Urban Consultants, August 2, 1967," Box 149, Memoranda from Editor, John Ormsbee Simonds Collection, Special & Area Studies Collections, University of Florida George A. Smathers Libraries.

These principles went through several iterations over the next several months as the group collaboratively edited, restructured, and re-allocated various portions of the text. Topics were multiplied and reduced: chapters on "Safety" and "New Legislation," for example, were added and then removed.[62] At meetings, members debated the wording and inclusion of various principles, and occasionally discussed possible uses of photographs and sketches to illustrate ideas and arguments. Between meetings they continued to debate wordings and the ordering of principles, sending out drafts and circulating comments by mail.

As they developed the report, the advisors continued to expand their use of systems thinking as a guiding framework. Systems analysis was frequently referenced throughout all of the book's sections. Rapuano encouraged Simonds to put more emphasis on the systems approach in the book's text. Kavanagh continued to supply Simonds with references and information regarding systems thinking, and Simonds wrote in return, "the more I learn of the 'Systems Approach' from you and the references - the more convinced I become that the application of this process to urban freeway planning is the most important proposal of our report."[63]

As they incorporated discussions of systems, board members also continued to seek balance in their promotions of rational and intuitive thinking. Simonds, for example, often sought to adjust language regarding the systems approach as he edited Kavanagh's passages: tempering

[62] "Agenda – Meeting, Board of Urban Advisors, BPR - September 26, 1967," Box 149, Agendas, Minutes, John Ormsbee Simonds Collection, Special & Area Studies Collections, University of Florida George A. Smathers Libraries.
[63] Rapuano to Simonds, October 13, 1967; Simonds to Kavanagh, September 17, 1967, Box 148, Correspondence, 1965-67, John Ormsbee Simonds Collection, Special & Area Studies Collections, University of Florida George A. Smathers Libraries.

descriptions of rational problem solving with references to "intuitive judgment."[64] Kavanagh, meanwhile, made efforts to emphasize that intuitive and creative approaches should be integrated into a systems approach.[65] However, despite efforts on all sides to evenly integrate creative and systems models of problem solving, the overall strategy of positioning qualitative expertise within a broader rational/technical approach continued to undermine the immeasurable aspects of design skill. For example, in one correspondence Kavanagh suggested:

> [Systems analysis] may all seem complex "double-talk" for what Mike [Rapuano] calls the routine procedure of any good designer. It has its value, however, in that is provides a completely fresh and general approach to a natural entity or system… it has a broadening effect on all who participate because they view the problem as a whole rather than restrict themselves to an isolated detail.[66]

In proposing that the interdisciplinarity of the systems approach enabled a holistic approach to problem solving that was otherwise elusive to all professions involved, Kavanagh dismissed the very expertise that the group's designers and planners identified as their unique and desperately-needed contribution to freeway planning. In essence, he failed to recognize that perceiving and visualizing "the problem as a whole" was, for designers and planners, intrinsic to their own expertise – indeed, it was the very matter towards which their design "intuition" was honed. This intuition, in turn, was directly related to their identification as urban designers and environmental planners.

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[64] In one of several drafts of principles, Simonds noted: "certain factors, such as those dealing with visual qualities or social implications, cannot be quantified. Consideration by the decision makers of such values can be made only on the basis of discussions with or written opinions by recognized authorities in each field. Such intuitive judgments may in some cases be a deciding factor. "Memo to: Advisory Board of Urban Consultants, August 2, 1967." Box 149, Memoranda from Editor, John Ormsbee Simonds Collection, Special & Area Studies Collections, University of Florida George A. Smathers Libraries.

[65] Kavanagh noted in the board's first meeting, for example, that "in systems language when you reach the point of analysis you optimize by either 1) models, b) experience, c) judgment, of which the last two are clearly intuitive." "Notes of the January 26 Meeting," 6.

[66] Thomas Kavanagh to Lawrence Halprin, February 10, 1966, Box 148, Correspondence, 1965-67, John Ormsbee Simonds Collection, Special & Area Studies Collections, University of Florida George A. Smathers Libraries.

If Kavanagh's misunderstanding demonstrated a fairly typical engineer's misconstrual of designers' softer forms of expertise, it was nonetheless exacerbated by the vagueness of his designer and planner colleagues' own descriptions. As discussed at length in this dissertation's earlier chapters, single-word terms – "intuition," "relationship," "environment" – often marked a great array of complex design practices that integrated measurable data with qualitative studies to envision landscapes on broadly interactive, dynamic, and multifaceted terms. Tacit as these practices frequently were, their very existence relied upon practiced engagement with the experiential, lived referents of an existing site. When removed from direct practice, the qualitative and immeasurable aspects of the freeway environment lost their dialogic and material impact: they became literally immaterial. In the abstracted realm of this principle-defining assignment, the holism, intuition, aesthetics, and creativity that designers saw as the province of their creative expertise were reduced to mere shadows of their real-world manifestations.

This dilemma would be amplified as the advisors crafted imagery for their report. Once writing was well underway, they began collecting and generating diagrams, sketches, and photos to illustrate various principles. Between fall 1967 and spring 1968, Simonds worked closely with newly hired book designer Jan V. White on late-stage text editing, image creation, and book layout.[67] Simonds and White asked various advisors to contribute different visual materials: Rapuano assigned employees at his firm to create a series of broad perspectival sketches of urban scenes, Kavanagh and Powell submitted sectional sketches of bridge and support styles and

[67] White had almost twenty years of experience as a book designer, art director, and architectural illustrator. Of particular interest to the advisors was his work on the recent report, *The Potomac*, a recently published, acclaimed government publication regarding strategies for sensitive development along the river. The report was conducted by a planning task force that included Ian McHarg and Grady Clay. "Jan White, Curriculum Vitae"; "Notes on Book Designers, November 15, 1967," Box 148, Correspondence, 1965-67, John Ormsbee Simonds Collection, Special & Area Studies Collections, University of Florida George A. Smathers Libraries.

configurations, and Roche provided sketches illustrating multiple uses of freeway corridors.[68] Several advisors took photos of freeways in their cities, and in a couple cases Simonds requested permissions to use photos and diagrams from other sources.[69] Simonds also drew and revised numerous diagrams illustrating different principles. Repeatedly reviewing and altering them in collaboration with White and other advisors, he eventually turned them over to a hired illustrator for the creation of final versions.[70]

Much as they had done with the book's text, the advisors generated visual materials collaboratively and iteratively: allocating, creating, editing, and reviewing them in various meetings, and passing them through many hands throughout the process. In key ways, however, they treated the drawings differently from the book's written passages. They had engaged the text as a medium of debate, exploration, and discourse; in contrast, they waited to develop drawings until the project's purpose and arguments were well defined. Furthermore, when they discussed the book's imagery, they tended to focus on its value as a source of visual interest and marker of design expertise.[71]

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[68] Jan White to John Simonds, January 23, 1968, Box 148, Correspondence, 1965-67, John Ormsbee Simonds Collection, Special & Area Studies Collections, University of Florida George A. Smathers Libraries.

[69] The majority of these photographs were used to illustrate new applications of computers. Ibid.

[70] Rapuano, Simonds, Kavanagh, Halprin, and White worked intensively together editing diagrams together at meeting in January 1968. John O. Simonds to Thomas Kavanagh, August 28, 1967; "Checklist – Meeting with Michael Rapuano, September 6, 1967," Box 148, Correspondence, 1965-67, John Ormsbee Simonds Collection, Special & Area Studies Collections, University of Florida George A. Smathers Libraries.
"Board of Urban Consultants – Meeting of Working Committee, 1/3/68," Box 149, Agendas, Minutes, John Ormsbee Simonds Collection, Special & Area Studies Collections, University of Florida George A. Smathers Libraries.

[71] In early 1967, Simonds noted that the highway officials wanted a book "well illustrated to instill a feeling for important design principles." In a letter to Simonds in fall 1967, Springer reinforced this illustrative character, writing, "I am still concerned about… the graphics. Without good graphics our work will be pretty bland." In his August 1967 book outline, Simonds wrote: "The illustrations (heavily used) will underscore, support and 'float' the text." "Meeting Notes, March 21, 1967," Box 149, Agendas, Minutes, John Ormsbee Simonds Collection, Special & Area Studies Collections, University of Florida

In these ways, the book's images were engaged more as a matter of strategic presentation than as a medium for discourse. These, of course, were not design drawings: the advisors had no site to analyze, envision, and alter. Rather, they were abstract illustrative diagrams, calibrated to depict ideal relationships between universalized entities: freeway, building, city, river, hill, valley. Unlike the drawing processes discussed in this dissertation's earlier chapters, then, this diagramming and sketching was not engaged as part of an evolving process of discovering the qualities of site. How, then, might we understand this work relative to preceding efforts to visualize the environmental dimensions of freeways and cities?

Among the book's various images, Simonds' diagrams offer the most useful material for exploring this question. Closely linked to the text's principles, used throughout the book, and repeatedly edited by the members of the advisory board, they were the most original of the book's drawings, the most discussed, and the most integrated with written content; they also provided the most consistent and recurring visual language in the final published product. Exploring these diagrams' visual styles, references, and connotations relative to their processes of making therefore offers a window into the advisors' broader approaches to design and drawing within this uniquely abstracted context.

Diagrams and diagramming have played complex and often contradictory roles in twentieth-century planning and design. Accordingly, scholars have attributed a disparate range of qualities to the form, and political dynamics to the practice.[72] Some have highlighted how diagrams' streamlined abstraction and sanitized representational styles have tended to amplify

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George A. Smathers Libraries. Martin Springer to John O. Simonds, September 20, 1967; "Memo to: Advisory Board of Urban Consultants, August 2, 1967," Box 148, Correspondence, 1965-67, John Ormsbee Simonds Collection, Special & Area Studies Collections, University of Florida George A. Smathers Libraries.

[72] Though there are some exceptions, the majority of historical writing on design diagramming has focused primarily on architectural diagramming.

modernist architecture's mechanical, reductive, and technocratic capacities. Hyungmin Pai, for example, has argued that modernist diagramming practices presented designed spaces as rational and technical, thereby serving to align architects with emerging governmental bureaucracies.[73] Andrew Shanken has similarly characterized the diagram as a managerial language whose utilitarian and functionalist qualities were adopted by architects in alignment with a 1930s rise in government bureaucracy and social sciences.[74] Several scholars have detailed ways in which domestic architectural diagramming practices evolved in association with scientific management and Taylorism.[75]

In contrast, scholars have also noted diagrams' creative and holistic dimensions. While recognizing that some twentieth-century diagramming practices promulgated technocratic facticity, Paul Emmons has also described how architects engaged diagrams' open qualities – such as loose lines and scalar indeterminacy – as a means for engaging vitalist, imaginative, and even "cosmopoetic" understandings of built space.[76] Simon Sadler has similarly highlighted the holistic and process-rich capacities of diagramming: he describes how 1960s countercultural

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[73] Hyungmin Pai, *The Portfolio and the Diagram: Architecture, Discourse, and Modernity in America* (MIT Press, 2002).

[74] Andrew M. Shanken, "The Uncharted Kahn: The Visuality of Planning and Promotion in the 1930s and 1940s," *The Art Bulletin* 88.2 (2006), 310–327.

[75] See, for example, Mary McLeod, "'Architecture or Revolution': Taylorism, Technocracy, and Social Change," *Art Journal*, 43.2 (1983), 132-147.

[76] Emmons suggests that these understandings can be seen to operate in diagrams' making reading both, suggesting: "The synoptic scalar view invites imaginative inhabitation of the drawing. When no clear relation exists between body and drawing, this inhabitation is at best partial and shifting." Emmons also describes ways in which designers in the 1920s and 1930s used diagramming as a means of understanding the natural world: noting that Patrick Geddes associated his diagrams with ancient mystical diagrams, and suggesting that for Le Corbusier "The organic is present in bubble diagrams in several ways: as the biological order of function, as the image of the organic, and as the expression of a vital spirit of creation." Paul Emmons, "Size Matters: Virtual Scale and Bodily Imagination in Architectural Drawing," *Arq: Architectural Research Quarterly* 9.3-4 (2005), 233. On Geddes: Paul Emmons, "Intimate Circulations: Representing Flow in House and City," *AA files* 51 (2005), 54. Regarding Corbusier: Paul Emmons, "Embodying Networks: Bubble Diagrams and the Image of Modern Organicism," *The Journal of Architecture* 11.4 (2006), 453.

architects and artists used diagrams as means for attuning to their environments, engaging diagramming processes as active manifestations of natural processes, patterns, and forces.[77]

Relative to these varied uses and readings, Simonds' diagrams were themselves mixed. In many ways they manifested a reductive, functionalist, and placeless approach to their subject; and yet they also invoked what we might, after Emmons, describe as an enviropoetic approach to the dynamic openness of freeway landscapes. In this mixing, the diagrams reiterated the very dynamics at play in the advisors' broader strategy and discourse. The drawings were dislocated from site, as was the advisors' project as a whole. In the resulting scale-less, place-less terrain, they manifested tensions between reductive and open understandings of freeway, just as the advisors grappled with tensions between rational and intuitive understandings in discussion and writing.[78]

These dynamics manifested in the diagrams' appearances, their references to preceding freeway projects, and the processes of their generation. In appearance, Simonds' diagrams depicted relationships between freeway, landscape, and city, using linear, amoebic, and circular forms that simultaneously manifested conceptual abstraction, and a more visceral spatial dynamism. Figures 5.1, 5.2, and 5.3 illustrate this mix. As demonstrated in the differences between Figure 5.1 and its sketched precursor (Figure 5.2), the illustrator's final tightening and smoothing of Simonds' linework largely elided evidence of hand drawing, retain very little of the loose quality apparent in the original hand-made forms. Figure 5.3 depicted the dynamic spatial

[77] Sadler argues that diagrams offer a uniquely open representational form, one whose "particular cutlines and geometries… *present* rather than *represent* process." Simon Sadler, "Diagrams of Countercultural Architecture," *Design and Culture* 4.3 (2012), 350.

[78] This scenario, in which designers' language and drawing manifest the same tensions and dynamics, is notably unusual relative to the other scenarios discussed in this dissertation, where designers' written and visual languages often contradicted each other. Presumably the alignment here is linked to the fact that these drawings, in their abstraction, were not produced through practices of designing sites, but rather through simpler illustrative means, and for polemic purposes.

relationships between freeway and satellite parking sites on energetic yet disembodied terms. On one hand, the diagram's fluid biomorphic forms evoked flowing motion. On the other, these elements were spatially incoherent: scale-less figures on an empty ground. In appearance then, the diagrams represented freeway environments on multiply contrasting terms: the imagery was crisply polished yet loosely open, spatially engaging yet ungrounded, kinetic yet disembodied in its floating abstraction.

In their references, these diagrams invoked a range of scientific, technical, and governmental approaches to measuring and mapping landscapes and cities; they also extended a twentieth-century design and planning tradition of attending to the dynamism of nature writ large. Figure 5.4's depiction of the city as a network within a circle, for example, was resonant with numerous twentieth-century representations of cities that interrelated cellular and technological imagery in studies of communication-oriented, economic, or defense-based dynamics in urban regions (Figures 5.5, 5.6).[79] Figure 5.7's arrow-based generalized depictions of movement at urban scales, meanwhile, resonated with earlier environmental planning approaches such those of Benton MacKaye in *The New Exploration* (Figure 5.8), in which he integrated a vitalist notion of nature with a more technocratic approach to economic and material flows.

Simonds' diagrams also referenced drawing practices much closer to home: borrowing representational styles and forms used in freeway design projects that the advisors had reviewed throughout their earlier research.[80] Such borrowing can be seen in Figure 5.9, which depicted the

[79] For more on connections between defense-based and communications-based diagramming of U.S. cities, see Peter Galison, "War against the Center," *Grey Room* 1.4 (2001), 5-33; Reinhold Martin, "The Organizational Complex: Cybernetics, Space, Discourse," *Assemblage* 37 (1998), 102-127.

[80] In addition to the references discussed here, the earlier sketched diagrams also show clear references to the work of Tunnard and Pushkarev, and to Halprin's book on freeways, both of which the advisors reviewed. Christopher Tunnard and Boris Pushkarev, *Man-Made America*; Lawrence Halprin, *Freeways* (New York: Reinhold Pub. Corp., 1966).

freeway as a line threading through a series of vaguely scaled, nebulous forms representing the surrounding environment: this reflected formal languages used by Alexander and Manheim and Ian McHarg in their earlier highway location projects.[81] Diagrams such as Figure 5.10 (see also Figure 5.11), meanwhile, used a radiating series of fine-lined arrows to represent the shifting views of drivers traveling in one direction along the freeway, with arrow-points landing on specific geographic and built forms to show the object viewed; just as Appleyard, Lynch, and Myer had done in *The View from the Road*.[82] Lastly, the loose linearity of many of these diagrams was resonant with many of Halprin's earlier studies of human and natural movements and flows (for example, Figure 5.12).

In all of these stylistic and formal associations, the diagrams pointed, sometimes quite directly, to earlier efforts to engage design practices as a means of attuning to the forces and flows of freeway environments. At the same time, the advisors' illustrative approaches to producing the FITC diagrams flattened the very processes of making to which they referred: the use of drawing to illustrate pre-determined principles significantly reduced the potential for the practices themselves to catalyze discovery.[83] The small scale of the sketches and late-stage haste in which they were produced reinforced this reduced role for drawing, as did the advisors' choice to hand the diagrams over to a hired illustrator in the final phase. Unlike their immediate

[81] See Chapter Four. Curiously, though the advisors discussed Alexander and Manheim's highway location work at length McHarg's 1965 highway location work was never read or referenced throughout this process, despite 1967 publication of that work in *Highway Research Record* and *Landscape Architecture Magazine*. It is possible that McHarg remained exceedingly unpopular at the BPR after to a 1965 presentation to them of his highway location project for I-95; in the presentation at which he was insultingly critical of their approaches to freeway planning and design. See Ian L. McHarg, *A Quest for Life: An Autobiography* (John Wiley & Sons, 1996), 183-189.
[82] See Chapter Three.
[83] The advisors' treatment of photography was not so different from their treatment of diagrams: replacing McQuade's proposed experiential photo-essays with quickly taken or pre-existing photographs of freeways meant that opportunities for expressing the specificity, and story, of a freeway site were traded in for depictions of freeways, not as something lived, but rather as a typology of structures, forms, and conditions.

precedents, then, these diagrams did not forge new design territory in visualizing freeways. They gestured to earlier innovative freeway design methods and drawing techniques, while severing their association with design experimentation.

Similar dynamics could be found in Simonds' own earlier drawing work. Diagrams such as Figure 5.13 were resonant with the abstract diagrams in his 1961 book *Landscape Architecture: Shaping Man's Natural Environment* (Figure 5.14). Those earlier diagrams were reminiscent of the pedagogical work of Paul Klee in their evocations of the energetics of natural and spatial conditions.[84] That said, Simonds' textbook drawings were used to illustrate highly defined principles of spatial organization: in this way he foreclosed their potential open quality, against the expressiveness of their dynamic forms and energetic descriptors. In his diagrams for the FITC, Simonds engaged an even more decisive foreclosure. His linework was less playful and tauter; the vague scales of the diagrams made them more disorienting and placeless; traces of the drawer's hand were less apparent. While Simonds' textbook drawings manifested a clear step away from earlier process-oriented influences towards a more illustrative definitiveness, the FITC drawings moved even further in that direction.

The FITC diagrams skirted an edge between science-connoting functional reduction, and more experiential, responsive approaches to freeways, cities, and environments. They did this in an abstracted, site-less context that exemplified a growing national-scale, bureaucratically defined approach to local freeway environmentalism. In deploying earlier open-ended drawing practices towards more definitive, placeless, and universalized uses, these diagrams manifested a

[84] Simonds encountered a range of modernist influences as a GSD student in the 1930s, so it is not surprising to find some resonance between his drawing style and Klee's naturalistic, process-oriented approach. Klee's influence on later modernist drawing practices is also discussed with regards to Christopher Alexander in Chapter 4. For more on Klee's open-ended, discursive approach to drawing, see John David Dewsbury and Nigel Thrift, "'Genesis Eternal': After Paul Klee," in *Deleuze and Space*, eds. Ian Buchanan and Gregg Lambert (University of Toronto Press, 2005), 89-108.

decisive modification of earlier modernist approaches, shifting them away from roles in design process and towards a use whose primary purpose was to *depict* designing: to signify design process and thinking in its absence.

After Publication: Towards a Bifurcated Environmental Politics

The Freeway in the City was released in May 1968. Eight thousand copies were printed and sent to federal transportation-related agencies, state-level highway programs, urban and suburban municipalities, universities, and a range of transportation associations and institutes throughout the country.[85] The book opened with sixteen "Major Recommendations." Additional principles were sorted thematically into seven chapters: "Comprehensive Planning and Community Values," "The View from the Freeway," Location of the Freeway," "The Roadway," "Highway Structures," "Multiple Use of the Corridor," and "The Systems Approach." All together, these chapters promoted a number of previously documented design ideas and approaches regarding freeway design, with an emphasis on procedural, interdisciplinary, legislative, locational, research, and education-based solutions to freeway issues.[86]

Overall, the advisors succeeded in promoting both an explicitly environmental approach to freeway design, and a broadly ecological understanding of cities. Many of the book's principles called for more environmental approaches to urban freeway design, and several identified a

[85] A handful of copies were also sent to consulting architects, landscape architects and planners. Memo to Advisory Board of Urban Consultants, March 6, 1968, Box 148, Correspondence, 1965-67, John Ormsbee Simonds Collection, Special & Area Studies Collections, University of Florida George A. Smathers Libraries.

[86] In addition to highlighting recent innovative approaches to freeway design, the book also referenced more traditional approaches to roadside beautification, as promoted by F.W. Cron, and William Brewster Snow. For works by both, see William Brewster Snow, ed., *The Highway and the Landscape* (Rutgers University Press, 1959).

direct association between systems thinking and environmental concerns.[87] Overall, it would seem that systems thinking bolstered the environmental aspects of the advisors' agenda: offering a means for identifying and operationalizing the dynamic, interrelational complexity that designers and planners understood to be central to the living dynamics of cities and metropolitan regions. In the book's final chapter, for example, the link between systems thinking and the environment was described as follows:

> A system may be described as any set of objects with relationship between the objects and between their attributes… Any system functions within the influence of its ENVIRONMENT, which is composed of those objects or factors lying outside the system which have a significant effect on it.[88]

In positioning the environment as an intrinsic element of the systems model, this description assumed that freeways were inherently enmeshed within environments – a notion that, as this dissertation's second chapter illustrates, had been controversial only a few years earlier.

The book extended this environmental characterization of freeway infrastructure even further, to encompass the city as a whole. The Introduction, for example, initially drafted by Halprin and then edited by the other advisors, outlined a series of perspectives and goals regarding U.S. cities, closing with a section on "Ecological Goals." Here the advisors stated:

> The most basic of [urban amenities] are ecological – the simple biological requirements which urban dwellers have every right to insist upon. Among these are a series of new freedoms – freedom from excessive noise, freedom from air pollution, freedom from physical danger.[89]

[87] The book's Chapter One, for example, included calls to locate freeways in ways that promote "a safe, clean, and healthful, living environment," and that would encroach upon parks, plazas, and other "open space preserves." Elsewhere, beauty was described somewhat environmentally as "a result of the sum total of carefully planned and sensitively handled elements." *The Freeway in the City*, 33-34, 38.
[88] Op. cit., 112.
[89] Op. cit., 14.

Here the advisors emphatically defined U.S. cities on terms that had previously been highly contested.[90] Freeways were systems, systems were embedded in urban environments, and those environments were in turn complex ecological conditions; these associations were made explicit in FITC. Furthermore, they were presented not as provocations, but rather as basic foundational principles. In this sense, the book demonstrated a clear success of the freeway debates to date: it inscribed in a governmental publication the outlook of a rapidly growing nationwide environmental movement, and therefore bolstered efforts to establish environmental principles as matters of governmental protection and legislation.[91]

Another notable aspect of this quote is the degree to which it associated the city's environmental characteristics with the rights of urban residents. This association was resonant with freeway protestors' arguments, and with the trio of 1966 acts that codified their rights to legal action. It was also prescient with regards to the many ways that the federal government would codify environmentalism in the ensuing years, as marked by legislation such as the 1969 National Environmental Policy Act and its initiation of Environmental Impact Assessment, the 1970 establishment of the Environmental Protection Agency, and the 1972 Clean Water Act.[92] At the same time, acknowledgement of rights was a very specific way to define freeway environments and their impacts. Defining residents' experiences of freeways on legal terms meant not only that such experiences could be defended in legislative contexts, but also that in

[90] See Chapter Two.
[91] The book called for greater legislative involvement and oversight regarding environmental concerns, including the creation of special state-level "environmental planning commissions" to oversee environmental issues. Op. cit., 17.
[92] For an account of federal environmental legislation, see Adam Rome, *The Bulldozer in the Countryside: Suburban Sprawl and the Rise of American Environmentalism* (Cambridge University Press, 2001), 221-154. For a broad overview of federal response to the freeway revolts more generally, see Mark H. Rose and Raymond A. Mohl, *Interstate: Highway Politics and Policy since 1939* (Knoxville: University of Tennessee Press, 2012), 135-158.

the defending they would be redefined on explicitly governable terms. In this sense, FITC's defining of the urban environment as a matter of rights both expanded and delimited the agencies of urban dwellers and the qualities of the environments in which they lived.

This dynamic is apparent in the editing of another passage of the book's Introduction, from Halprin's first draft to the final published form. The first draft highlighted a need for design innovation that could support new levels of community involvement in public planning:

> Complex as [the freeway] problem is it requires new attacks, new processes, new goals. In the development of these processes one of the major tasks will be to involve the people in the city, not only in the decision making but in the very analysis of values and the weightings which must be given.[93]

The final version emphasized a more conservative stance regarding both design innovation and the role of urban dwellers in public process, stating:

> Many of the proposals which follow are not original… The proposals are not intended to be revolutionary but rather, taken all together, to be a creative force in the accelerated evolution of urban freeway planning and design.[94]

Here we find a distinct shift: away from innovation and community-based power, and towards disavowing revolution. This change reflects the fact that some of the advisors disagreed with Halprin regarding the degree to which locals should have agency in evaluating freeway options. Indeed, in text edits passed between Simonds and Kavanagh regarding Halprin's first draft of the Introduction, Kavanagh wrote: "Being practical and perhaps harsh, local citizens are never and will never be in the position of comparing and evaluating." Simonds, in the margins,

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[93] "Chapter – The City (for Urban Consultants Report to BPR)," Box 148, Critical Comments, John Ormsbee Simonds Collection, Special & Area Studies Collections, University of Florida George A. Smathers Libraries.

[94] *The Freeway in the City*, 15. Relative to Halprin, Simonds and the other advisors likely played moderating roles in the editing of this text, especially regarding the potential for community involvement in public planning.

noted, "Agreed!"[95] A couple lines earlier, Kavanagh even more directly illustrated the emerging governmental interest in defining local conceptions of urban environments, writing: "the basic purpose for this report is to formulate a policy by which community values can be evaluated and standardized."[96]

The shadow side of the expanding 1960s governmental effort to codify the rights of urban dwellers was the degree to which it conditioned the very practice and performance of the urban environment: what it was, how it operated, and how it was experienced in everyday life. This constraint played out for the advisory board's designers and planners as well, with regards to the roles of holism, immeasurability, and indeed "intuition" in their own processes of planning and design. While the advisors succeeded in making the environmental qualities of freeways and cities explicit, they were far less successful in their repeatedly stated desires to promote and protect the qualitative dimensions of design process relative to technical and quantitative governmental approaches.

This compromise was on display throughout the final FITC publication, in an ongoing oscillation between statements foregrounding experiential concerns, and arguments in favor of more technically defined approaches.[97] It was also apparent in the fact that the only practice-oriented principles in the book were to be found in the final chapter on "The Systems Approach."

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[95] Kavanagh Draft Edits, ND, Box 148, Critical Comments, John Ormsbee Simonds Collection, Special & Area Studies Collections, University of Florida George A. Smathers Libraries.
[96] Ibid.
[97] For example, the book's first Major Recommendation directly called for a systems approach as "the most rational approach to the problems of planning, locating, and designing urban freeways." The recommendation's three-paragraphs of text closed, however, as follows: "No planning approach, technique, or methodology, however, should be allowed to diminish the role of the intuitive designer. Improved methods of information gathering and analysis are highly desirable, but their translation into superior design calls for creativity and professional skill which is an essential and critical step in the freeway development process. Op. cit., 16.

Here the methods advocated were not design-based, visual, or site-related; they were instead managerial, procedural, computational, and technological.[98]

Conclusion

The urban advisors sought to make places for urban environmentalism and design perspectives within an increasingly technocratic, federal-scale governmental process. Their strategy for achieving this involved a mix of delocalization, deferral, abstraction, and veiled assertion. The advisors distanced themselves from local contexts at many points in their process. They took great care not to be too critical of earlier freeway failures, to maintain a technical and generalized approach to their subject, and to jettison more cultural approaches to freeways in favor of procedural ones. They also depicted cities and freeways in the abstract: as entities with universal qualities. Towards this end they embraced a "systems approach," using it as a model for understanding the city as an environment, and a structure for integrating creative design expertise into existing engineering and legislation-based practices.

The advisors did seek to counter the potentially mechanistic reduction of the freeway environment in some ways: calling on comparably universal notions of "creativity" and "intuition" to signify their professions' engagements of irreducibility and holistic thinking within design process. Yet they undermined their own resistances as well: repeatedly deciding against site-oriented, community-engaging approaches in favor of actions, narratives, and imagery that reinforced ways of seeing and working already endorsed by highway engineers and government officials. In privileging a systems approach, the advisors eroded one way of relating to urban

[98] This chapter primarily focused on means for structuring interdisciplinary collaboration, setting up clear problem solving structures, and identifying the most important factors regarding freeway location and design.

environments in favor of another, more strategic one. They diminished spatial, lived, and immediate approaches to living sites in favor of representing environmental design practice as politically actionable, bureaucratically communicable, and interdisciplinarily transferable.

It would seem that this compromise-oriented approach to freeway design did succeed at being palatable, at least, to its primary audience of engineers and government officials. D. W. Loutzenheizer, Chief of the federal Highway Standards and Design Division, wrote to Rapuano two months after the book's release: "I have talked to a number of engineers and find a general interest and enthusiasm as a result of their review of *The Freeway in the City*." The report, however, did not appear to have a significant effect on future freeway designs; there would be no noticeable increase in designer or planner involvement after its publication, and local freeway conflicts and controversies would continue apace for several years.[99] Furthermore, the federal environmental legislation soon to be implemented would, in many ways, shift the terms of freeway debates yet again, as "environmental impact" became the basis on which potential freeway sites were evaluated.[100]

The Freeway in the City in many ways marked the end of environmental freeway design's brief flurry of experimentation. Yet this denouement was also a beginning: for as designers' explorations of freeway design began to wane, the issues, themes, approaches, and politics that the subject had surfaced would migrate and morph, taking newly significant shapes. In this sense, the FITC project manifested a crucial moment: its internal push and pull between localized and

[99] Edward Muller notes that it is difficult to evaluate the report's impact, but that it seemed to have little to no effect on freeway engineering practices, or the controversies surrounding them. Muller, "Acceptably Pleasing," 895.

[100] With regards to evaluating environmental impact, in the 1970s freeway planning and design projects increasingly deployed the kinds of layered analysis that were innovated in the highway location projects discussed in Chapter Four. See, for example, Johnson, Johnson & Roy, Inc., *Considerations in the Highway Planning & Route Location Process* (Michigan Dept. of Transportation, 1972).

technocratic environmentalism exemplified tensions and conflicts at play in the late 1960s regarding exactly what forms "the environment" would take in the coming years.

Much as the FITC book's characterization of urban ecology reinforced a contemporaneous change in environmental politics, its quietness with regards to design process and innovation reflected broader shifts occurring in U.S. design professions at the time. The FITC board's approach was resonant with a growing sense among design professionals that in order to continue participating in city building, they would need to downplay their disciplines' focuses on cultural and creative transformation and the situated character of design expertise relative to locality and site, and instead emphasize approaches that were translatable and coherent within governmental, bureaucratic contexts.[101] This very wager that design expertise was translatable in such a way was at the core of the urban advisors' project.

And yet this *was* a wager: its potential successes and pitfalls were not yet known. One of its likely problems was that design expertise, in abstraction, ran the risk of losing its significance altogether. Methodologically, was there any place for creative, situated thinking within a systems approach to urban environments? And, casting that question in a broader context: could governmentally-defined approaches to environmental issues make space for "intuitive" holistic, situated attunement to large living landscapes? Could systems-based approaches recognize that environments were not merely living, but also *lived*?

The designers and planners of the advisory board were not necessarily sold on their own FITC arguments. Indeed, in some cases they showed markedly different attitudes in their other design work. Halprin in particular would develop recognizably contrasting approaches to those

[101] This was a subject of debate in the special August 1967 issue of *Public Architecture* on systems thinking and urban design.

espoused in FITC. Even while participating in the advisory process, he remained involved in local freeway controversies: in April 1967, for example, he testified in favor of protestors at a federal hearing regarding the very New Orleans controversy that the advisors had agreed not to engage.[102] At home, meanwhile, he was experimenting with community-based environmentalism: conducting a series of sensory-oriented environmental workshops – "Experiments in Environment" – with his wife, Anna Halprin.[103]

One of the photographers of these workshops was Paul Ryan, who McQuade had hired for the abandoned FITC photo-essay on El Camino Real. Ryan and Elaine Mayes, the other California photographer whom McQuade had hired, would both establish themselves as photographers by documenting events at the epicenter the of hippie movement: the Haight-Ashbury neighborhood and adjacent Panhandle Park.[104] Also living and working in the Bay Area by the mid-late 1960s were Christopher Alexander, Donald Appleyard, and Philip Thiel. These west coast designers would mix roles as established professionals and academics with an embrace of "countercultural" perspectives, in ways that were arguably less culturally available to their east coast counterparts. Together with other west coast designers they would cultivate environmental design practices that retained the experiential and holistic dimensions of their

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[102] Baumbach and Borah, *The Second Battle of New Orleans*, xiii, 142.

[103] These workshops are recounted in Lawrence Halprin and Jim Burns' book *Taking Part*, and were also the subject of a recent Graham Foundation exhibition. Lawrence Halprin, and Jim Burns, *Taking Part: A Workshop Approach to Collective Creativity* (The MIT Press, 1974); "Experiments in Environment: The Halprin Workshops, 1966-1971," Graham Foundation, September 19 – December 13, 2014. http://www.grahamfoundation.org/public_exhibitions/5241-experiments-in-environment-the-halprin-workshops-1966-1971 (last accessed July 18, 2017).

[104] For a profile on Mayes, see Sarah Hotchkiss, "She Photographed Jimi Hendrix Without Knowing His Name," *KQED Arts*, June 5, 2017. https://ww2.kqed.org/arts/2017/06/05/she-photographed-jimi-hendrix-without-knowing-his-name/ (last accessed July 28, 2017).
Mayes' and Ryan's websites each reference their 1960s works as foundational. "Elaine Mayes, Photographer: A Life in Photography, 1960s-Present," http://www.elainemayesphoto.com/ (last accessed July 28, 2017); "Paul Ryan Photography," http://www.paulryanphotography.com/ (last accessed July 28, 2017).

earlier freeway experiments, in contrast with the systematic, governmentally-effective approaches exemplified by highway location analyses and *The Freeway in the City*.[105]

Select moments throughout the FITC process gesture towards the popular, "countercultural" environmentalism that was taking place elsewhere. McQuade's early plan to send young photographers road-tripping along the El Camino Real is one such moment. Another is Rapuano's warning to Simonds that engineers would balk at "longhair" ideas. More elliptically, the book's edited assertion that the advisors' approach was in no way revolutionary invokes the countercultural movement as well. Such instances demonstrate that the advisors were not only well aware that a contrasting form of environmentalism was on the rise but were also, in other contexts and roles, often promoting it themselves.

The primary tensions within the FITC project regarded whether to document and define the freeway in site-based or abstracted terms, and how to integrate design "intuition" into more mechanistic approaches to environmental design. These would soon be reflected in a much larger bifurcation in the environmental movement: between a standardized governmental environmentalism, and a cultural movement that cast environmentalism as a transformative everyday practice and a radical way of living.[106] This split would manifest multiply, in a series of cultural, political, generational, and coastal divides. The urban advisors' shadow perspective with regards to the immeasurability of environmental experience, while heavily circumscribed

[105] For accounts of the various ways that west coast designers intersected with countercultural movements in the 1960s-70s, see Greg Castillo, "Hippie Modernism," *Places Journal* (2015), https://doi.org/10.22269/151026; Sadler, "Diagrams of Countercultural Architecture"; Simon Sadler, "An Architecture of the Whole," Journal of Architectural Education 61.4 (2008), 108-129 .

[106] Greg Castillo recounts how the 1970 International Design Conference at Aspen, whose theme was "Environment by Design," became a site of contestation regarding these perspectives. Castillo, "Hippie Modernism."

and constrained in the FITC work, would nonetheless continue to gain momentum – in other contexts, and on other coasts – in the years to come.

Figure 5.1. Diagram illustrating the principle that freeways should align with existing urban grid patterns. Note the smooth linework and regularized patterning relative to Figure 5.2. Michael Rapuano and U.S. Advisors to the Highway Administrator, *The Freeway in the City (*U.S. Govt. Print. Office, 1968), 50.

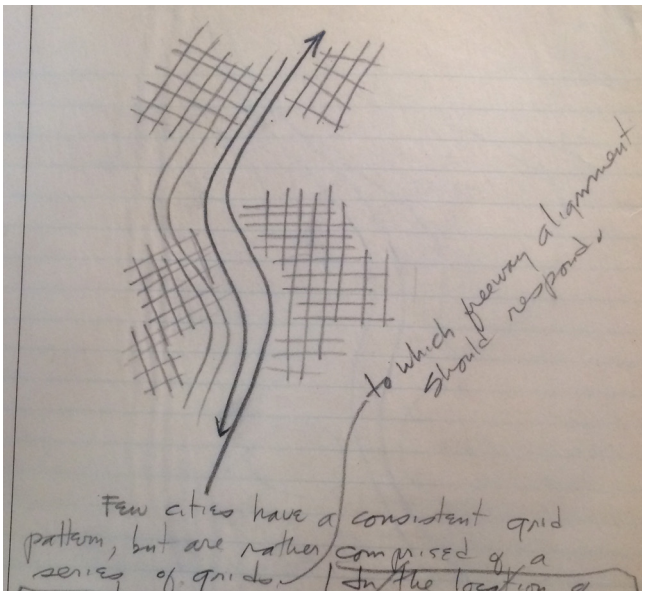

Figure 5.2. Sketch, pencil on lined letter paper, on which Figure 5.1 was based. Box 149, Agendas, Minutes, John Ormsbee Simonds Collection, University of Florida Smathers Libraries - Special and Area Studies Collections.

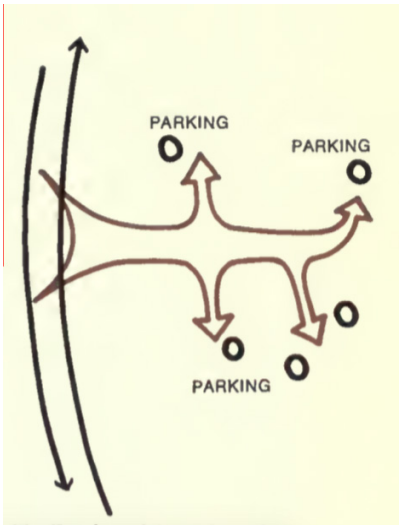

Figure 5.3. Diagram illustrating the principle that parking facilities should be located at strategic locations within the city, such as near freeway interchanges. Rapuano et.al., *The Freeway in the City*, 29.

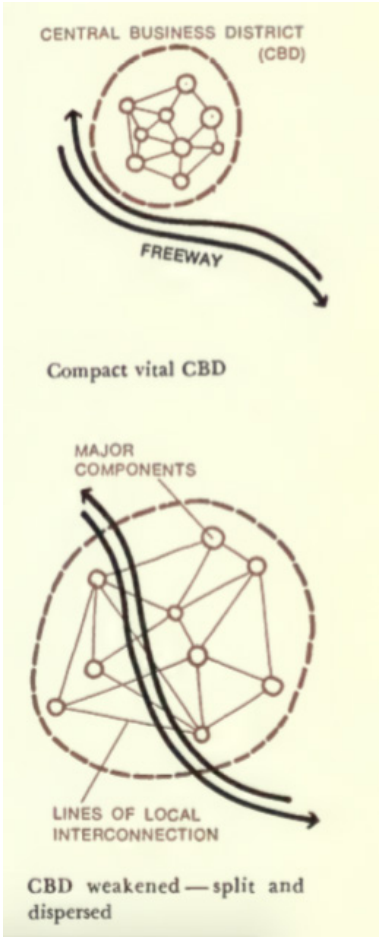

Figure 5.4. Diagram illustrating the principle that freeways should not compromise connectivity between key elements within a central business district. This is one of several circular city forms in the book. Rapuano et.al., *The Freeway in the City*, 27.

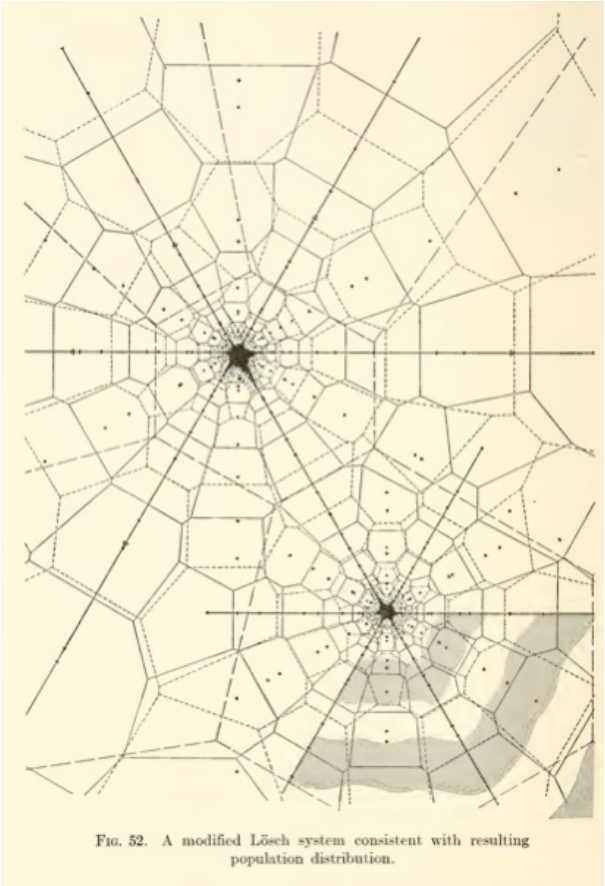

FIG. 52. A modified Lösch system consistent with resulting population distribution.

Figure 5.5. Diagrammatic model showing sites of industrial production and related populations dispersed relative to urban cores, as derived from mathematical formulae determining optimal urban distribution. Note the calculation-derived cellular patterning and radial geometries defining connectivity between centers. Walter Isard, *Location and Space-Economy: A General Theory Relating to Industrial Location, Market Areas, Trade, and Urban Structure* (Massachusetts Institute of Technology, 1956).

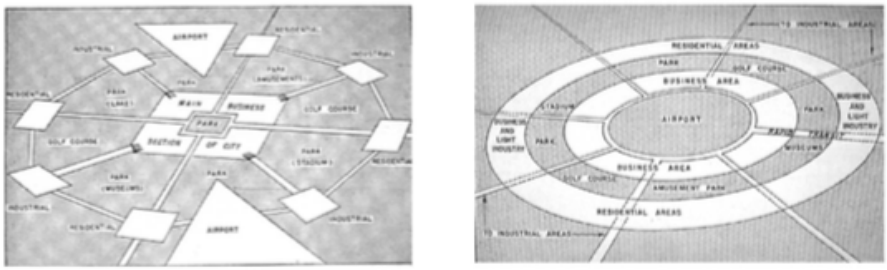

Figure 5.6. Diagrammatic illustrations of urban configurations designed for strategic defense against atomic weapons, using a mix of circular and radial patterns characteristic of imagery frequently used in postwar defense-oriented urban planning. From Ralph E. Lapp and Robert R. Wilson, "Must we hide?" *Physics Today* 2.9 (1949): 32, as reprinted in Reinhold Martin, "The Organizational Complex: Cybernetics, Space, Discourse," *Assemblage* 37 (1998), 102-127.

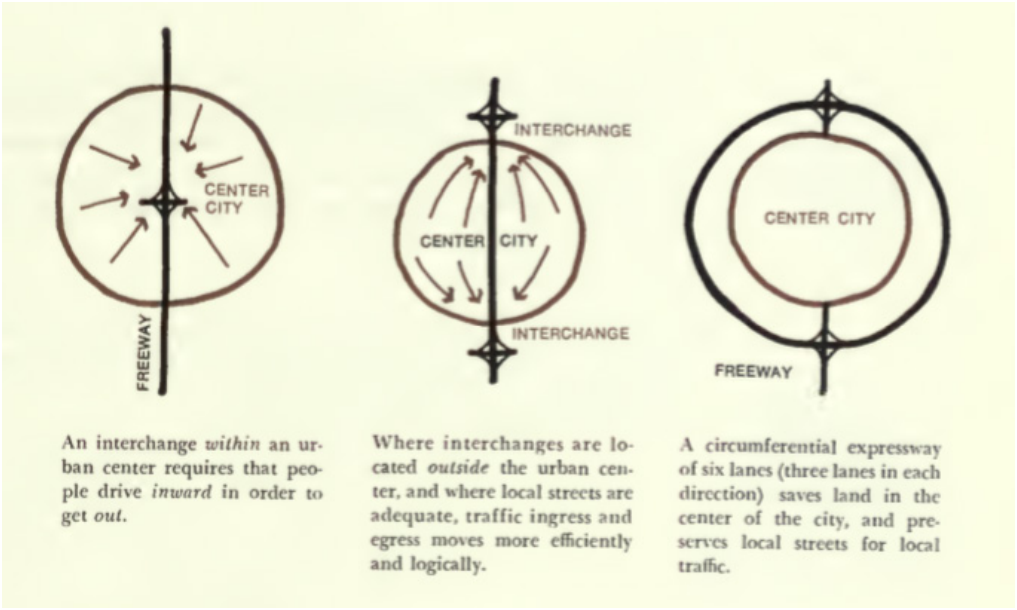

Figure 5.7. Diagrams illustrating the principle that freeways should ring cities rather than be located within them, with arrows used to show generalized movement of cars within cities. Rapuano et.al., *The Freeway in the City*, 27.

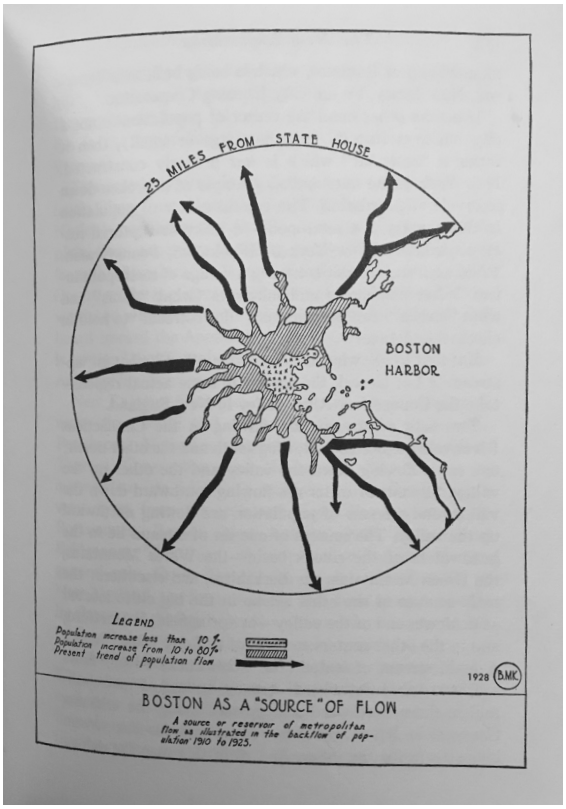

Figure 5.8. A regional diagram of Boston, with arrows used to generally depict population movement ("flow") from Boston outward to surrounding areas. Benton MacKaye, *The New Exploration: A Philosophy of Regional Planning* (Harcourt, Brace and Company, Inc., 1928), 173.

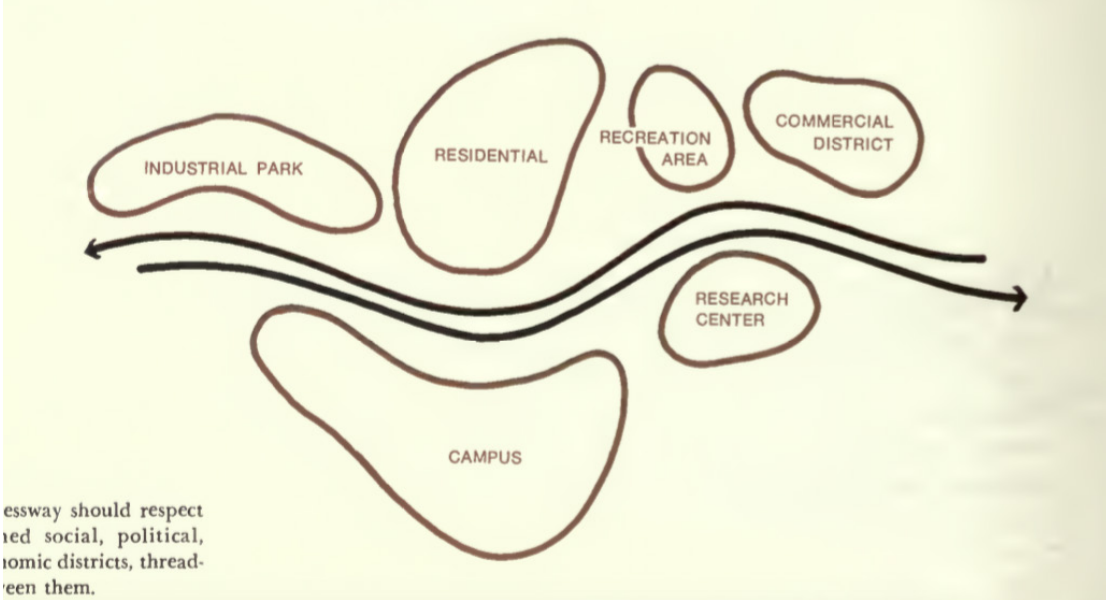

Figure 5.9. Diagram illustrating the principle that freeways should not intersect existing districts within cities. The use of loosely dispersed amoebic forms to represent various land uses is similar to visual languages used in the highway location diagrams discussed in Chapter Four. Rapuano et.al., *The Freeway in the City*, 32.

Figure 5.10. Drawing illustrating the principle that freeways should be positioned to reveal appealing views of urban environments. Uses of fine-lined arrows representing vision match similar uses in *The View from the Road* (see Chapter Three). *The Freeway in the City*, 39.

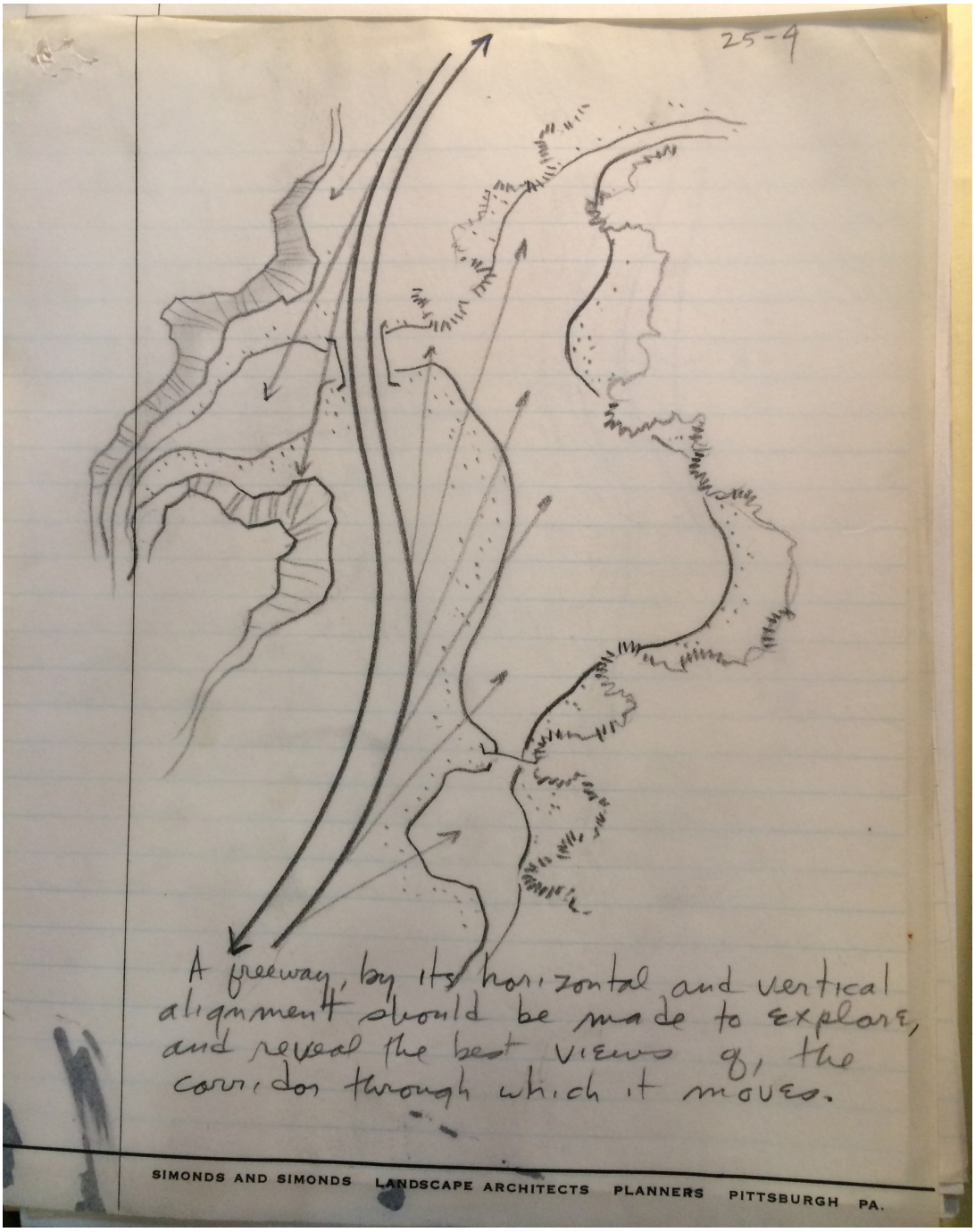

Figure 5.11. Sketch, pencil on lined letter-size paper, on which Figure 5.12 is based. A similarity to of drawing conventions used to represent drivers' views in *The View from the Road* (Chapter Three) is more pronounced here than in the final printed version of this drawing. Box 149, Agendas, Minutes, John Ormsbee Simonds Collection, University of Florida Smathers Libraries - Special and Area Studies Collections.

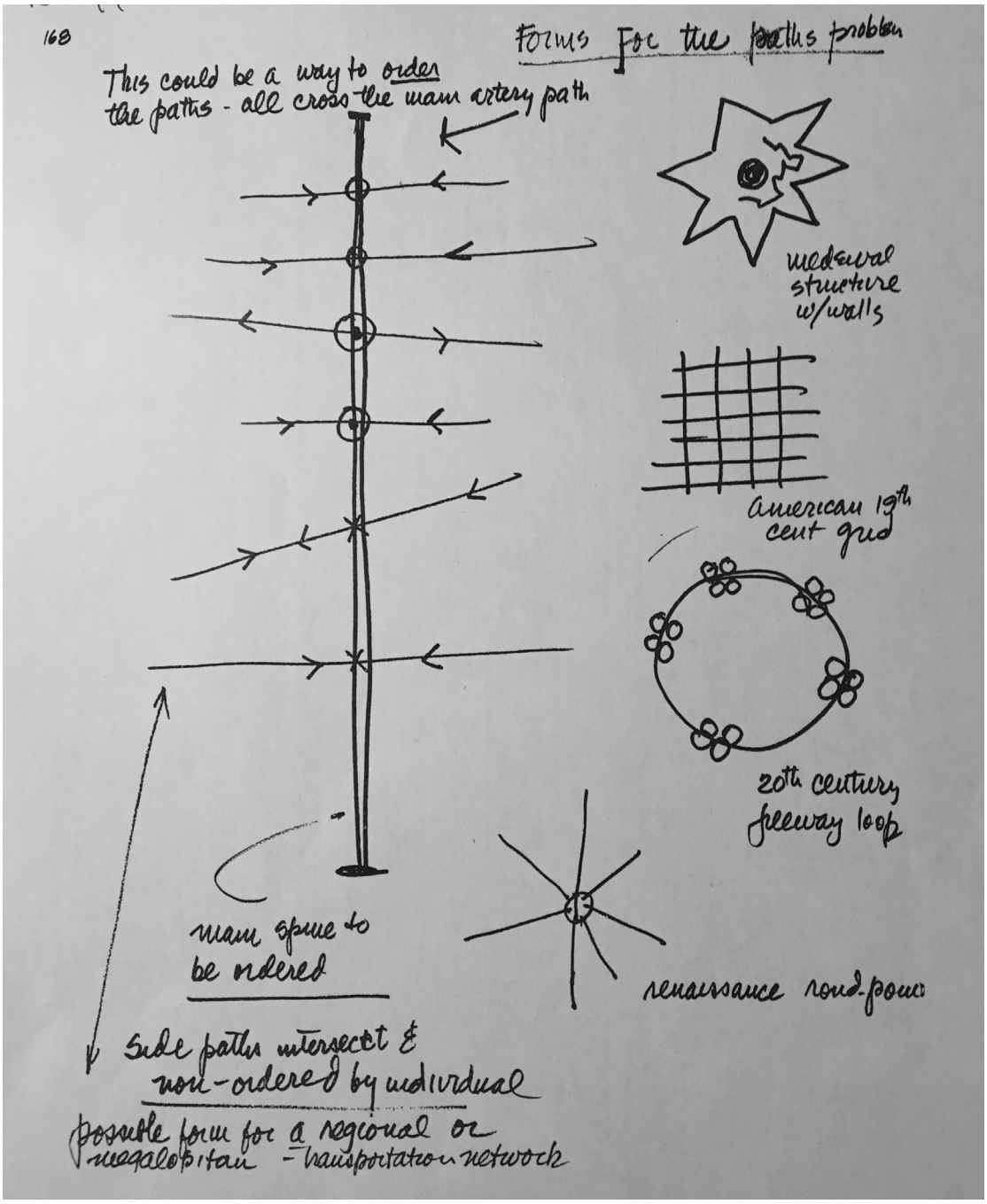

Figure 5.12. A 1966 notebook sketch by Halprin studying options for ordering a series of paths relative to a central artery (left), considered in relation to broader historical patterns of structuring urban movement. Note associations here between individual movement and regional transportation. Lawrence Halprin, *Notebooks 1959-1971* (Cambridge: MIT Press, 1972), 168.

Figure 5.13. Diagram illustrating the principle that freeways should vary in their distances from water bodies so as to provide drivers engaging views. Curvilinear forms are used here to represent both freeway movement and river flow. Rapuano et.al., *The Freeway in the City*, 38.

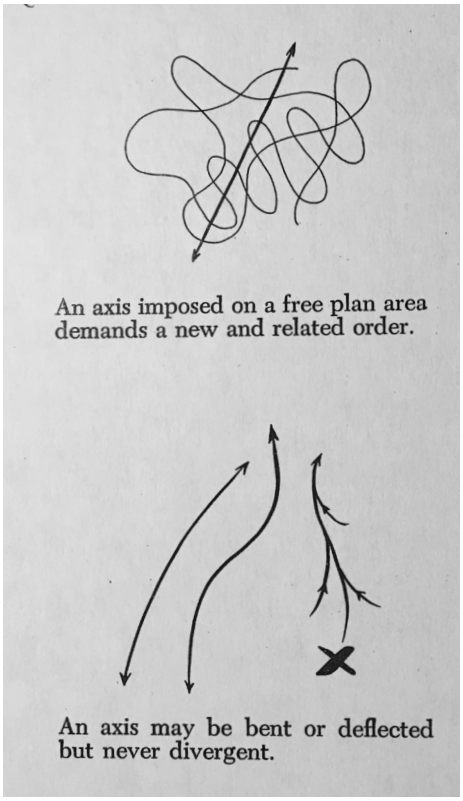

Figure 5.14. Diagrams illustrating compositional landscape ideas regarding the experiential and ordering powers of axes. Note the use of curvilinear forms to depict movement. John Ormsbee Simonds, *Landscape Architecture: The Shaping of Man's Natural Environment* (New York: F.W. Dodge Corp., 1961), 124.

CONCLUSION

In November 1967, in an effort to come to terms with nationwide urban freeway controversies, the U.S. Senate Committee on Public Works' Subcommittee on Roads held a congressional hearing on urban highways. In two several-day sessions, the subcommittee heard testimonies from a mix of highway engineers, designers and planners, local, state, and federal officials regarding the problems of urban freeways. Among the designers invited to speak was Ian McHarg, who, after briefly summarizing his I-95 highway location project, closed with the following:

> I think plumbers are marvelous men, and our society could not endure without them, and highway engineers are very decent people, too, just so long as it is understood that highway engineers can only treat a highway as it deals with inanimate things, with projectiles, and we limit their competence to pavements, bridges, and geometrical alignment, but add a leavening of those people who understand something about the nature of man and something about the nature of biophysical processes… I think plumbers are absolutely admirable, but we don't ask them to design cities.[1]

McHarg's comment that highway designers must understand "the nature of man" is worth mention, as it resonated with his broader efforts at the time to carve out roles for designers as people who understand the natural qualities of cities. By using it here as a descriptor rather than a central subject however, McHarg both invoked nature and avoided the question of its definition. In just a few years, that definition had, in fact, changed quite significantly. Five years prior, Lawrence Halprin's description of the Panhandle Freeway's "environment" had been shunned by California highway engineers; now a concern for urban "ecology" anchored a federally-

[1] There is some irony in McHarg's celebration of the I-95 project as an alternative to engineers' problematically reductive approaches to highway design, given that his project largely replicated an engineer's method. *Urban Highways: Hearings before the United States Senate Committee on Public Works, Subcommittee on Roads, Ninetieth Congress, First Session, on Nov. 14-16, 28-30, 1967* (Washington: U.S. G.P.O., 1967), 63.

sponsored publication regarding best practices in freeway design.[2] What, now, was this human, biophysical, urban nature to which McHarg alluded, in light of the preceding years' freeway controversies? And what was the character of designers' expertise in designing that nature?

For McHarg, it would seem that the designer's role was to mediate between government and scientists. When asked at the hearing what kind of research was needed in order to successfully locate highways, McHarg did not, in fact, mention designers at all; he called instead for involving geologists, climate scientists, wildlife resource managers, natural scientists with expertise in soils and plant associations, and social scientists.[3] At this hearing then, McHarg abstracted both the nature he sought to protect, and his very own position in protecting it: he represented both nature and designer, but situated neither.

One should not make too much of this curious positioning: some of it was surely a matter of phrasing and personality, and McHarg was neither the first nor the last to reference nature without defining it. Yet his commentary does point to a larger pattern at play, one in which he was embedded, and to which he actively contributed. McHarg's abstracted, managerial characterization of the environmentalist designer was on the rise in these years, and indicated a developing trajectory for environmental and urban design in the years soon to follow.[4]

Meanwhile, just a couple months prior to McHarg's testimony, *Progressive Architecture* published a special issue on "performance architecture," exploring the use and potential of

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[2] The publication referred to here is *The Freeway in the City*. See Chapter Five. Michael Rapuano and U.S. Advisors to the Highway Administrator, *The Freeway in the City* (US Govt. Print. Office, 1968).
[3] *Urban Highways*, 63.
[4] For more on this characterization in both McHarg's work and in broader interdisciplinary discussions of cybernetics, see Margot Lystra, "McHarg's Entropy, Halprin's Chance: Representations of Cybernetic Change in 1960s Landscape Architecture," *Studies in the History of Gardens & Designed Landscapes* 34.1 (2014), 71-84.

systems analysis in urban design applications.[5] In the introduction, editor and architect Jan C. Rowan celebrated the importance of art in design, and asked what the fate of artistic practice was to be in a systems-based world. Explicitly equating art with the task of undoing social repression, he asked:

> If Performance Design (i.e., design based on reason and reality, a subject to which this issue of P/A is devoted) should replace the more intuitive and less rational approach of the past, where will architects-as-artists go? When your life is devoted to a struggle with reason and reality, it is unlikely that you will be happy by marrying them. It is this conflict between wanting to be part of civilization and a desire to subvert it that will really make schizos of us for some time to come.[6]

The resonance of Rowan's language with that deployed by the urban advisors in Chapter Five is clear: once again, we find tension between intuition and rational approaches, and an invocation of creativity as essential to design work.[7] Also akin to the urban advisors – and to McHarg's upcoming highway testimony – Rowan's wording is abstracted: a generalized characterization of design work that obscures the details of the practices that comprise it.

McHarg and Rowan's comments articulated real concerns regarding the roles and responsibilities of environmental and urban designers relative to technological and governmental change. Both reflected a newly activist form of urban design. Both referenced, albeit in different

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[5] After an overview of systems approach – its general theory, terminology, uses in project management problem analysis, and the kinds of organizations using it, the issue was divided into several sections concerning "The Changing City," focusing on government, transportation (which focused not on freeways but on mass transit), practice, aesthetics, and the building industry. *Progressive Architecture* (August 1967).

[6] Regarding the subversive character of art, Rowan wrote: "art struggles against repressive reason and the reality-principle in an effort to regain lost liberties… Art, if its object is to undo repressions, and if civilization is essentially repressive, is in this sense subversive of civilization." *Progressive Architecture*, 103.

[7] With the exception of a description of the environment as an element of systems theory (as Kavanagh had described it in the *Freeway in the City* project), the topic was not foregrounded in this issue. Nonetheless, the themes are closely aligned with those analyzed in Chapter Five, and tended to crossover into more explicitly environmental discussions at this time as well. See, for example, Garrett Eckbo and Neil Porterfield, "Too Much Analysis or Designers' Fantasy? An Eckbo-Porterfield Exchange," *Landscape Architecture Magazine* 60.3 (1970), 200-202.

ways, a peculiar conundrum of their moment: cities and their environments were simultaneously more graspable and more abstracted than they had been before. Locally, cities were becoming more livable and more social, as civil rights, environmental protection, and historic preservation movements, sometimes in synergy with countercultural movements, together mobilized concerns for urban rights and stewardship.[8] At the expanding federal level, meanwhile, cities and their environments were as distant as they were close: recognizable and manipulable, but only through highly circumscribed bureaucratic procedures and codes.

Even as they captured this dilemma, both McHarg and Rowan maintained profession-centric narratives; in doing so, they arguably failed to engage the territories in which their work was being most intensively impacted. The broad social and governmental contexts surrounding design work were changing rapidly: the futures of cities and landscapes were becoming enmeshed in legislative frameworks and technological developments.[9] At the scale of design practice, meanwhile, new technologies and pressures to legitimate design expertise in governmental contexts were transforming how designers performed the actions of designing. Massive social, governmental, and technological shifts were changing how designers designed; in turn, alterations in the many small actions of observing, drawing, computing, and attuning to were impacting how people conceived, perceived, imagined, and defended landscapes and cities.

In this light, what U.S. designers framed as "intuitive," "creative" work in the 1960s was a matter of how they engaged their real-world subjects in the acts of designing, and also of how openly they did so. How many different entities and dynamics were incorporated into visualization? To what degree were those entities delimited on the page? How indeterminate was

[8] An example of this trend is detailed in Chapter Two.
[9] See Chapters Four and Five.

the process of engaging them? How precisely did the designer constrain different parts of the drawing? All of these technical and methodological decisions determined the degree to which the designer acknowledged other agencies – of residents, protestors, trees, soils, weather – throughout the design process.

These issues are as relevant to designers today as they were in the 1960s, particularly in the stead of recent landscape urbanist and infrastructure movements. Indeed, the very subject matters of the 1960s recur today: urban infrastructures, design at very large scales, the promises and problems of new technologies, and, increasingly, the question of how to live in attunement to the agencies of living landscapes.[10] Techniques and methods innovated in the 1960s also recur, as designers today frequently privilege multi-layered, abstract, digitally-derived, systems-based approaches. Even the terms with which U.S. designers were occupied in the 1960s – "environment," "ecology," "systems" – remain central to current design discussions; though they are now more assumed than questioned.[11]

Given these resonances, the issues and themes of the 1960s freeway debates remain highly relevant today. The governmental and economic networks that took shape through the 1960s became the basis for contemporary globalism, and for an attendant expansion in the scale of our environmental problems. That expansion is now exemplified in climate change: an issue no smaller than the entire planet. Thus far, our comprehensions of this massive dynamic have

[10] See, for example, Charles Waldheim ed., *The Landscape Urbanism Reader* (New York: Princeton Architectural Press, 2006); Kelly Shannon & Marcel Smets, *The Landscape of Contemporary Infrastructure* (Rotterdam: NAi Publishers, 2010); For an example of more recent efforts to highlight practices of attunement, see Karen Lutsky and Sean Burkholder, "Curious Methods," *Places Journal* (2017). https://doi.org/10.22269/170523.

[11] Regarding systems specifically, see, for example, Michel Hoessler, "Open Source Systems," in *Territories: From Landscape to City*, ed. Lisa Diedrich (Basel: Birkhäuser, 2009), 129-131; Kristina Hill, "Landscape as System; System as Landscape," in *Landscape as System: Contemporary German Landscape Architecture*, ed. Bund Deutscher Landschaftenarchiteckten (Heidelberg: Birkhäuser, 2009), 26-45.

largely been developed through techno-scientific means: as such, our environmental circumstances are frequently represented today through logics that are problematically divorced from the contours and textures of lived, everyday life.

Current discourse on the Anthropocene often circulates around this issue, resulting in a common refrain: humans must come to terms with our radically new planetary condition in ways not only technical, but also felt.[12] As part of this conversation, some scholars of the built environment are increasingly calling for experimental approaches to designing very large-scale environmental conditions: advocating for new techniques and methods that attune to others, negotiate scale, and integrate measurement and imagination.[13] In short, there is growing recognition that it is time to look once again for new ways of seeing, visualizing, and activating large-scale landscapes: ways that can knit the textures of lived experience together with the vast planetary conditions on which living depends.

But how can designers go about cultivating such immediate *feeling* for environments, given the massive scales and obvious technical problematics of current environmental challenges? As a landscape architect, historian, design instructor, and engaged citizen, I have developed this dissertation with that question in mind. I thereby write not only to historians and theorists, but also to design teachers and practitioners, with awareness that it is especially timely and important today for individuals in all these fields to pursue new capacities and trajectories for design work.

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[12] From promoting imaginaries that counter "the managerialisms latent in our own ideas of sustainability" to advocating for tempering techno-scientific approaches with practices of care, environmental humanities scholars assert that our current climatological crisis demands more culturally-engaged means of engaging environments. James Graham et. al., eds., *Climates: Architecture and the Planetary Imaginary (*New York, NY: Columbia Books on Architecture and the City, 2016), 12; Maria Puig de la Bellacasa, "Making Time for Soil: Technoscientific Futurity and the Pace of Care," *Social Studies of Science* 45.5 (2015), 691–716.

[13] See for example, Jennifer Gabrys, "Sink: The Dirt of Systems," *Environment and Planning D: Society and Space* 27 (2009), 666-681; Emily Eliza Scott, "Archives of the Present-Future: On Climate Change and Representational Breakdown," in Graham et.al., eds., *Climates*, 130-140.

In this matter, historical scholarship can catalyze significant transformation: for in order to cultivate new practices, it is useful to first come to terms with their value and impacts *as* practices. In that spirit, I have investigated the import of *how* designing is practiced; and I have revealed the often-surprising ramifications of experimenting with that how. I have demonstrated that a seemingly opaque comment, such as Halprin's assertion that "the design of a great freeway is an intuitive act of the most demanding and imprecise kind," when read both closely and expansively, can reveal multitudes.[14] I have shown that by interrogating his terms, examining the specific design actions underlying his assertion, and investigating the experiences, cultures, and controversies in which those actions were embedded, we find a wealth of questions and issues relevant to designing today: regarding how designers integrate computational analysis with concerns for the experiential qualities of sites, how groups of people come to terms with publicly impactful natural phenomena, and how designers find ways to feel sites whose interrelated components are too extensive and complex to immediately comprehend.

I have thereby demonstrated that by engaging more praxiographic approaches, historians and theorists can begin to develop more fine-grained analyses of design actions, and therefore cultivate more concrete discourse with regards to the work of designing. By demonstrating how designers' technical and methodological choices impact and are shaped by the broader social and governmental contexts in which they work, especially during periods of environmental and infrastructural contestation, such discourse can support a more nuanced attentiveness to designing's substantial real-world impacts; not its built impacts, necessarily, but rather its social and cultural ones. This dissertation thus offers a historical, social, practice-oriented foundation for discussing contemporary questions that, among designers, can often feel vague, unmoored,

[14] Lawrence Halprin, *Freeways* (New York: Reinhold Pub. Corp., 1966), 4-5.

indeed relatively inarticulable.

In elucidating these largely unspoken aspects of designing, I have discovered again and again that the designing individual is never alone. On the contrary, designers' actions are continually conditioned by forces beyond them: philosophies of instructors, circumstances of training, available technologies, the limits and capacities of sites, and more. This dissertation's design analysis and discourse should prompt historians, educators, and practitioners alike to reflect on the ramifications of designers' contingent positions, political embeddedness, and ways of working: because by casting the agencies of designers and their living sites in a new light, we can begin discussing, seeing, and engaging those agencies in innovative ways. In this sense, the work presented here extends the experimental environmental spirit of the very projects it investigates. Much like its designer and activist subjects, this dissertation names phenomena so that they might be activated: towards new perspectives and practices on a rapidly changing planet.

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